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Promoting Lower-Carbon Lifestyles:
The role of personal values, climate change communications and carbon allowances in processes of change

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Declaration

This thesis and the papers within it have been composed by me and are my own work, except where otherwise stated. No part of this thesis has been submitted for any other degree or qualification.

Rachel Howell
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Abstract

Climate change is a pressing problem and substantial reductions in the greenhouse gas emissions that cause it are necessary to avert the worst impacts predicted. The UK has targeted an 80% reduction from 1990 emissions levels by 2050. This thesis investigates how to promote behavioural changes that will reduce emissions associated with individuals' lifestyles, which comprise a significant proportion of the UK total.

The thesis begins by appraising whether and how climate change communications, specifically films, can succeed in changing attitudes and behaviour. The impacts on viewers of the film *The Age of Stupid* were assessed using a four-stage panel survey. Increased concern, motivation to act, and sense of agency felt immediately after seeing the film did not persist, but respondents reported some behavioural changes. The longer-term follow-up suggests that behavioural intentions do not necessarily translate into action, but also revealed issues concerning the reliability of participants' causal attributions of their behaviour. These and other challenges of conducting longitudinal studies of behavioural change related to climate change communications are discussed. The thesis then uses a model of behavioural change transposed from health psychology to analyse the processes of change employed or depicted by four climate change films, in order to identify more generally the strengths and limitations of films as means to promote mitigation action, and to demonstrate the potential utility of the model in the field of pro-environmental behaviour change.

The issue is then considered from the opposite angle, with an examination of what has motivated individuals who have already adopted lower-carbon lifestyles. Qualitative research reveals that protecting 'the environment' *per se* is not the primary value stimulating most interviewees' action; typically they were more concerned about the impacts of climate change on people in developing countries. Although analysis of a survey instrument showed that biospheric values are important to the participants, they tended to score altruistic values significantly higher. Thus it may not be necessary to promote biospheric values to encourage lower-carbon lifestyles.

The final element of the work involved researching the opinions of members of Carbon Rationing Action Groups, seeking to understand what can be learned from their experiences of living with a carbon allowance, and the implications that the findings may have for potential government policies, especially personal carbon trading.

The thesis concludes that, given the scale of action required, the difficulties individuals face when considering whether and how to adopt lower-carbon behaviours, and the limited impact of initiatives such as Carbon Rationing Action Groups and *The Age of Stupid* beyond a relatively small circle of people who tend to exhibit particular traits (such as a preference for frugality), significant UK emissions reductions will necessitate far-reaching legislation that will impact on everyday practices and behaviour.

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I am very grateful to all the people who participated in my research projects, for giving their time and sharing their views with me. It was particularly enjoyable to meet with those I interviewed and I admire their efforts to live more sustainably.

Dad kindly proofread the whole thesis for me, with satisfying pernicketiness.

Others to whom I owe thanks for help with particular aspects of this work are named at the end of each of the relevant papers of this thesis (Chapters 4–8).

Finally, I would like to acknowledge the influence of friends and family on my passion to discover, implement in my own life, and communicate to others effective, fair, and sustainable solutions to the problem of climate change. My upbringing and the guidance of parents, teachers, and other influential people instilled in me a thirst for social justice and consequent concern about this issue. Judith Lancaster has helped me to follow my passion, make decisions, and 'keep my heart up'. To be alive to the threat we are facing from climate change, to care intensely about the fate of those who will suffer as a result, and to feel implicated in the responsibility for that suffering is, it often seems to me, to be awake in a nightmare world while everyone else sleeps on oblivious. However, this is not the case; I am thankful to know many people who are taking action, and to have been at the Yearly Meeting in August 2011 at which Quakers in Britain committed to becoming a 'low-carbon, sustainable community'. I am very glad to have friends with whom I share this concern and commitment, and from whom I draw support and hope.

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Acronyms and abbreviations

ABC	Attitudes-Behaviour-Context (model of behaviour)
AoS	*The Age of Stupid* (film)
C&C	Contraction and Convergence (proposed global emissions reduction framework)
CCCAG	Climate Change Communication Advisory Group (UK)
CO_2	carbon dioxide
CRAG	Carbon Rationing Action Group
CRAGger	member of a Carbon Rationing Action Group
DECC	Department of Energy and Climate Change (UK)
Defra	Department for Environment, Food and Rural Affairs (UK)
DETR	Department of the Environment, Transport and the Regions (UK, 1997–2001)
DTI	Department of Trade and Industry (UK, 1970–2007)
DTQs	Domestic Tradable Quotas
EAC	Environmental Audit Committee (of the UK House of Commons)
E-E	entertainment-education
ERB	environmentally responsible behaviour
EU-ETS	European Union Emissions Trading System
GHG	greenhouse gas
IPCC	Intergovernmental Panel on Climate Change
LETS	local exchange trading systems
NAM	Norm Activation Model (of pro-social behaviour)
NGO	non-governmental organisation
ONS	Office for National Statistics (UK)
PACT	Personal Allowance Carbon Tracking
PBC	perceived behavioural control
PCT	personal carbon trading
PEB	pro-environmental behaviour
SAGES	Scottish Alliance for Geosciences, Environment and Society
SDC	Sustainable Development Commission (UK, 2001–2011)
SPSS	Statistical Package for the Social Sciences
TfL	Transport for London
TIB	Theory of Interpersonal Behaviour
TPB	Theory of Planned Behaviour
TRA	Theory of Reasoned Action
TTM	transtheoretical model (of behavioural change)
VBN	Value-Belief-Norm (theory of pro-environmental behaviour)

Part One: Background

Chapter 1: Introduction

Climate change is increasingly recognised as a major global challenge. The Intergovernmental Panel on Climate Change (IPCC) reports a range of current and expected future impacts of climate change such as rising sea levels (leading to increased coastal inundation), hundreds of millions of people exposed to increased water stress, species extinctions, increased risk of floods and storms, changes to agricultural productivity, and negative impacts on human health (IPCC, 2007a, b). David King, the former Chief Scientific Advisor to the UK Government, asserted that climate change poses a greater threat than terrorism (King, 2004); the Stern Review on the Economics of Climate Change warned that the costs of failing to address the problem would be at least 5% and could rise to more than 20% of global gross domestic product every year (Stern, 2006). Dramatic reductions in the greenhouse gas (GHG) emissions that cause climate change – principally carbon dioxide (CO_2) – are necessary to avert the worst scenarios, although we are already committed to significant warming (Anderson and Bows, 2011; Matthews and Caldeira, 2008). The UK Climate Change Act of 2008 mandates an 80% reduction in UK GHG emissions from 1990 levels by 2050 (HM Government, 2008).

1.1 Climate change and individuals' lifestyles and behaviour

Druckman and Jackson (2009a) estimate that between 1990 and 2004, households were responsible for 76% of UK GHG emissions; the Office for National Statistics puts the proportion as high as 85% in 2001 (ONS, 2004). Just over one-third of these emissions arise from direct energy use (gas, electricity, and other household fuels, plus personal transport fuels); the remainder are 'embedded' in products and services (including flights, which are sometimes counted as part of 'direct emissions' budgets; see Chapter 8) (Druckman and Jackson, 2009a; ONS, 2004). Food, home energy use, and transport create the majority of emissions (Michaelis, 2003; Tukker et al., 2010).

One way to interpret emissions is to consider the end purposes for which fossil fuels and other resources are used. For example, 'transport' may be employed for

leisure or commuting purposes, amongst others. Figure 1 (below) shows the proportions of UK household GHG emissions in 2004 that were associated with nine categories of activity. The largest share of emissions is attributable to the 'recreation and leisure' group, while other emissions are linked to needs such as keeping warm, fed, and clothed.

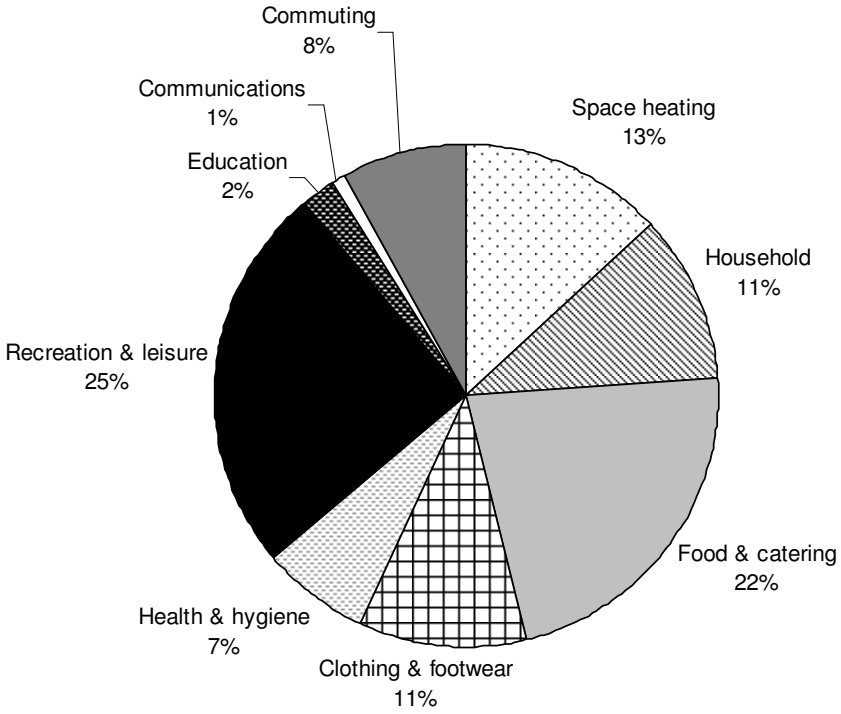


Figure 1: Sources of UK household greenhouse gas emissions 2004
Source: Druckman and Jackson (2009a).

There are huge variations in energy use and associated emissions between households (Druckman and Jackson, 2009b; Ekins and Dresner, 2004; Gram-Hanssen, 2010; Keay-Bright and Fawcett, 2005). These are strongly related to income; for example, Druckman and Jackson (2009b) calculated average annual CO_2 emissions for seven types of UK household segmented by socio-economic characteristics, and found that the emissions of the wealthiest segment were 64% higher than those of the least affluent group. However, as well as a positive correlation between income and emissions, there are also large variations in energy use and associated emissions *within* income deciles (Ekins and Dresner, 2004). Moreover, Gram-Hanssen (2010) states that even in technically identical houses,

energy usage can vary by 300% or 400%; she concludes that individuals' behaviour and everyday practices play a considerable role in determining levels of household energy consumption.

Given the UK GHG emissions reductions targets, the high proportion of UK emissions attributable to individuals/households, and the fact that these emissions are related to individuals' (deliberate and habitual) behaviour and not merely to factors such as the thermal efficiency of different houses, there is a clear case that "Dangerous climate change cannot be avoided solely through high level international agreements; it will take behavioural change by individuals and communities, particularly in relation to their housing, transport and food consumption decisions" (Stern, 2006, p. 395). Individual action is an important element of the UK Climate Change Programme – the government strategy to address climate change – which states: "We will encourage individuals as citizens, consumers, motorists and business people to take the action needed to help meet our goals" (HM Government, 2006, p. 4).

Over the past twenty years there have been several UK government mass communication campaigns to promote 'pro-environmental' behaviour. 'Helping the Earth Begins at Home', which ran for several years from 1991, aimed to increase awareness of the link between individuals' energy use and climate change, and to encourage people to "use energy more wisely", but was met with scepticism that individual action could make any difference, unwillingness to act when others were perceived as unlikely to do the same, and belief that responsibility for change lies with the government and corporations (Hinchcliffe, 1996). The 1995 'Going for Green' initiative was criticised for failing to recognise that simply providing information is not enough to promote behavioural change (Blake, 1999), while an evaluation of the 'Are You Doing Your Bit?' initiative launched by the Department of the Environment, Transport and the Regions in 1997 concluded that this campaign to "stimulate public action to protect the environment" had achieved good 'brand recognition' but made little difference to public attitudes or behaviour (DETR, 2000). A report by the Environmental Audit Committee (EAC, 2003) concluded that the 'Going for Green' and 'Are You Doing Your Bit?' campaigns had been ill-focused, and that further general awareness-raising campaigns would not be worthwhile;

instead it was recommended that a long-term initiative focussing on specific priorities should be developed. The report also advised: "Future mass media campaigns should concentrate on reinforcing positive behaviour through incentives, rewards or reassurance and be supported with a range of practical opportunities for behavioural change at both individual and institutional levels" (EAC, 2003, p. 35).

These campaigns had all been focussed on disseminating information and messages urging behavioural change through the mass media. From 2000, more schemes offering advice and grants/subsidies to encourage take-up of energy efficiency measures were funded, and from 2006 onwards there has been an increased focus on community-level projects and programmes delivered by non-governmental organisations (NGOs) promoting behavioural change, through initiatives such as the Greener Living Fund and the Low Carbon Communities Challenge.

Large-scale mass communication campaigns are also still employed. In 2009 the Department for Energy and Climate Change (DECC) developed a media campaign focussing on climate change impacts to support the government's online 'Act on CO_2 carbon calculator' (which provides personalised recommendations for action based on the information individuals input about home energy use and travel). The television advertisement, which featured a father reading his daughter a bedtime story about climate change in which a cartoon dog drowns because of flooding, was criticised for being upsetting and scaremongering (Sweney, 2009), while two of the press adverts were banned by the Advertising Standards Authority because they judged that the language used should have been more tentative (Sweney, 2010). Meanwhile, the GHG emissions attributable to households have been increasing in recent years (Druckman and Jackson, 2009a), so there is clearly a need for a better understanding of how to communicate effectively about climate change, what interventions might help to promote 'lower-carbon lifestyles', and what motivates those who do engage in climate change mitigation action.

1.2 Terminology

In what follows I adopt the shorthand terminology that has become common in 'lay' discourses, and indeed in academic social science research on climate change

mitigation action: ‘carbon’ is generally used in place of ‘carbon dioxide’ in lexical compounds such as ‘carbon footprint’ and ‘carbon allowance’, which often encompass other GHGs too (through ‘carbon equivalence’ measures or simply by association). This is imprecise, even scientifically incorrect, but as this work is concerned not with climate science but with public attitudes and behaviours related to climate change, terminology which reflects that which is in common usage is appropriate.

In this thesis, **promoting lower-carbon lifestyles** means encouraging the adoption of technologies and/or behavioural changes that will reduce the GHG emissions associated with the practices comprising individuals’ lifestyles (such as keeping warm and clean, eating, shopping, commuting, and leisure pursuits). A person who has adopted a lower-carbon lifestyle has reduced his or her **carbon footprint** (the amount of GHGs emitted by one’s activities over the course of a year) relative to previous years. Paper 4 (Chapter 7) defines adopting a lower-carbon lifestyle slightly more narrowly as “making changes to one’s lifestyle *in order* to reduce one’s carbon footprint” (p. 188, emphasis added) because it presents findings from a study of individuals who have each deliberately altered their behaviour with the specific intention of mitigating climate change. However, technologies and practices that reduce GHG emissions might be taken up by individuals for other reasons, such as saving money (Whitmarsh, 2009a), or because of different ethical concerns (e.g. becoming a vegetarian for animal-welfare reasons; Hards, 2012); thus it is not generally assumed in this thesis that a lower-carbon lifestyle must necessarily be associated with any particular motives. Similarly, the term **lower-carbon behaviour** denotes behaviour that causes lower GHG emissions than alternatives, whatever the rationale for that behaviour (see Table 1, p. 25, for examples).

Climate change mitigation action, on the other hand, is used to mean action taken specifically for the purpose of addressing climate change, including awareness raising and campaigning (see Table 1, p. 25) as well as lower-carbon behaviours.

In places (especially the literature review, Chapter 2) I refer more generally to **pro-environmental behaviour** (PEB). By this I mean behaviour that reduces the negative impact of one’s actions on the natural and built world, compared to

alternatives. In this I differ from others such as Anja Kollmuss and Julian Agyeman, who define PEB as "behavior that *consciously seeks to minimize* the negative impact of one's actions on the natural and built world" (Kollmuss and Agyeman, 2002, p. 240, emphasis added). For the purposes of this thesis, a definition that encompasses habitual behaviour and actions undertaken for reasons other than (or in addition to) environmental concern (see e.g. De Young, 2000; Hallin, 1995) is appropriate. Examining the literature on PEB also suggests that the term commonly includes actions that are only *relatively* 'pro-environmental' (e.g. driving a fuel-efficient car, rather than not driving at all), thus the focus on *reducing* rather than *minimising* impact, in the definition used here. This definition of PEB encompasses what is meant in the literature by 'sustainable consumption', not used in this thesis (for simplicity).

In Chapter 7, the term **environmentally responsible behaviour** (which I define there as "behaviour that seeks to reduce the negative impact of one's actions on the natural or built environment, whether or not this is done for ecocentric reasons") is used instead, for reasons explained in that paper (see p. 188).

The definitions of lower-carbon lifestyles/behaviour and pro-environmental behaviour used herein encompass three types of 'consumption behaviour': purchasing; managing equipment and technology; and using products and services (cf. Swim, Clayton, et al., 2011); and three (sometimes overlapping) categories of behaviour that I have labelled 'non-consumer behaviours': avoidance; waste minimisation; and do-it-yourself (creating or organising goods and services for oneself rather than buying them). A fourth category of non-consumer behaviour, awareness-raising and campaigning, is included in the definition of 'climate change mitigation action'; actions of this type are part of promoting lower-carbon lifestyles, directly through persuading individuals to act, and indirectly by lobbying for government intervention. Table 1 (p. 25) gives examples of each type of behaviour.

Lower-carbon behaviours include both discrete actions such as installing insulation, and ongoing lifestyle changes such as cycling rather than driving to work, and it should be noted that action often lies on a spectrum from 'not acting' to 'doing all the time', which individuals move along in either direction at different times of life, for a variety of reasons (Hards, 2011a).

Table 1: Examples of different types of lower-carbon behaviours and other climate change mitigation action

Consumption behaviours		
Purchasing	Managing equipment and technology	Using products and services
Buying energy-efficient products Choosing a 'green electricity' tariff Buying local/organic/ seasonal food Installing insulation	Not leaving electrical appliances on standby Keeping car tyres at optimum pressure Defrosting freezer so it runs efficiently	Washing clothes at low temperatures Cycling Taking a shower instead of a bath *Sharing products and services:* Belonging to a car club Living with unrelated others Using public transport Hiring equipment rather than owning it

Non-consumer behaviours			
Awareness-raising and campaigning[a]	Avoidance	Waste minimisation	Do-it-yourself
Lobbying politicians Attending events Talking to friends to raise awareness Monitoring energy use/carbon footprint (Illegal) direct action	Not eating meat Giving up/reducing flying Avoiding over-packaged products Walking instead of driving short distances	Recycling Composting Mending Avoiding over-packaged products Giving unwanted goods to charity shops	Growing food Composting Mending Carrying tap water in a reusable bottle

Note that some behaviours can be classified in more than one category.
[a] This category of behaviour is included in the definition of 'climate change mitigation action' and is related to promoting lower-carbon lifestyles, but is not 'lower-carbon behaviour'.

1.3 Research questions, aims and approach

The overarching question guiding this research is: What kinds of communications, interventions, and policies will encourage the general public to adopt lower-carbon lifestyles? The objective is to be able to make recommendations for policymakers, NGOs, and concerned individuals, regarding how best to promote climate change mitigation action (primarily lower-carbon behaviours, but also engagement in activities that could lead indirectly to emissions reductions, such as lobbying for legislation).

An initial scoping study of the literature suggested that this entails consideration of many issues and potential avenues for research. Questions include:

- What do the public need to know and understand about climate change to motivate and undertake deliberate mitigation action?

- What do they already know, and where are the gaps in knowledge and understanding?
- What factors other than knowledge and understanding influence attitudes and behaviour relevant to climate change mitigation?
- What kinds of communications and other interventions have so far been employed to encourage climate change mitigation action, and how effective have they been?
- What are the barriers – practical, psychological, and social – to individuals taking action and making emissions-reducing behavioural changes?
- What motivates people who have already adopted lower-carbon lifestyles, and what can we learn from their experiences of behavioural change?
- Are there insights and models relating to behavioural change from fields other than pro-environmental behaviour that might usefully be employed in promoting lower-carbon lifestyles?
- Is there potential for policies and interventions that promote lower-carbon lifestyles without relying on individuals to take action specifically to mitigate climate change?

This is not an exhaustive list, but is indicative of the breadth and complexity of the issue. Obviously it was necessary to narrow the scope of this thesis; therefore, after a thorough review of the literature to understand how far these questions could already be answered, I chose to focus on the following five specific aims (for which the rationale is given in Chapter 3, section 3.1):

1. Assess the impact of a climate change film that utilises a fear-based appeal on the attitudes and behaviour of the audience it gained when it opened in cinemas (Paper 1, Chapter 4);

2. Assess the longevity of those impacts, especially any behavioural changes made (Paper 2, Chapter 5);

3. Analyse climate change films using a model of behavioural change from health psychology to (a) identify their strengths and limitations as means to promote climate change mitigation action, and (b) demonstrate the potential utility of the model in the field of pro-environmental behaviour change (Paper 3, Chapter 6);

4. Examine the motivations for, and pathways to engagement in, lower-carbon behaviours and lifestyles (Paper 4, Chapter 7);

5. Understand the experiences and opinions of individuals attempting to live within a carbon allowance, and assess the implications for potential policies (especially personal carbon trading) (Paper 5, Chapter 8).

Climate change is a 'wicked problem' (Rittel and Webber, 1973) or 'social mess' (Horn and Weber, 2007), characterised by complexity, uncertainty, a contested problem, resistance to change, and numerous possible approaches to solutions/ resolution, none of which is definitively correct but instead judged better or worse according to personal beliefs and values. Thus an interdisciplinary approach to the question of how to promote mitigation action is necessary; no single discipline can provide a broad enough understanding of how and why people might respond to such a problem. Although this thesis is strongly influenced by social and environmental psychology perspectives, it also draws on sociology, health psychology, human geography, behavioural economics, and environmental education. Climate change research considered by the IPCC is heavily biased towards the natural sciences and economics (Bjurström and Polk, 2011); as a result, climate policy discussions focus on climate predictions and creating new economic policy instruments, and fail to consider other approaches such as re-thinking societal values or learning from cultural myths (Hulme, 2011). An interdisciplinary social science approach such as is taken here can offer new insights.

Recognising that attitudes and behaviour are not static, the thesis also takes a dynamic approach, investigating how and why changes happen over time, using a variety of methodological tools including longitudinal research, a process-based model of behavioural change, and interviewing techniques that invite participants to explore their stories of change.

A third aspect of the approach is that this research attempts to consider whole lifestyles rather than single behaviours. This is because individuals who adopt lower-carbon behaviours in one area, or under certain circumstances, do not necessarily then do so more generally (Barr, Shaw, et al., 2011), and studies need to take account of the risk of a 'rebound effect', whereby financial savings from energy efficiency or curtailment in one area are used to fund other emissions-causing activities that would

not otherwise have taken place (Crompton, 2008; Wilson and Hawkins, 2011). Although a range of behaviours was examined as part of this approach, in general the focus was on practices that make a significant contribution to mitigating climate change, as recommended by Steg and Vlek (2009) and Swim, Stern et al. (2011), rather than those (such as recycling) that have only limited emissions-reducing potential.

1.4 Structure of this thesis

Having set out in this chapter the rationale for and aims of the thesis, I now turn to a review of relevant literature (Chapter 2). This is necessary in addition to the much shorter reviews provided in each of the later papers, in order to give a proper overview of the context for the particular areas of study and the research methods chosen. Chapter 3 explains the methodology of the research and presents an outline of the development of, and linkages between, the studies that are reported in each of the five papers that form the main body of this thesis (Chapters 4–8). Chapter 9 offers a synthesis of results and draws conclusions about promoting lower-carbon lifestyles, while Chapter 10 details limitations of the work and recommendations for further research. As the thesis is based on papers that must stand alone, some repetition is unfortunately unavoidable to ensure that adequate background is included, but each paper represents a distinct contribution to the whole.

Chapter 2: Knowledge, attitudes, behaviour, and behavioural change: a review of literature relevant to promoting lower-carbon lifestyles

2.1 Public knowledge, understanding, and concern about climate change

Over the past two decades, a substantial body of evidence has developed about public knowledge, understanding, and concern regarding climate change, especially in the USA (e.g. Borick and Rabe, 2010; Kempton, 1991; Leiserowitz, 2007a; Nisbet and Myers, 2007; Pew Center, 2007; Reynolds et al., 2010; Weber and Stern, 2011) and the UK (e.g. Anable et al., 2006; BBC, 2010; Bord et al., 2000; Downing and Ballantyne, 2007; Ipsos MORI, 2008; Norton and Leaman, 2004; Poortinga et al., 2006). There are also general 'environmental attitudes and behaviours' surveys that include questions on climate change, covering England (Defra, 2007, 2009), Scotland (Hinds et al., 2002; Scottish Government, 2008) and Wales (Ipsos MORI, 2011) separately. Data from other countries are more limited, but there are studies from Australia (Bulkeley, 2000; Henderson-Sellers, 1990) and New Zealand (Bell, 1994a); Lorenzoni and Pidgeon (2006) include perspectives from the USA and 15 European countries, while Leiserowitz (2007b) is the most comprehensive survey, summarising results of several studies that between them cover 46 different countries in all the continents except Antarctica. The latter report concluded that "it appears that although large majorities of the global public are aware of global warming, some, particularly those in Islamic countries, in rural parts of the developing world, and notably in India, remain unaware of this issue, at least as conceptualized by modern science" (Leiserowitz, 2007b, p. 34). However, in Scotland and England – where the empirical research for this thesis took place – recent studies show that 99% of respondents have heard of climate change, although 4–10% of the samples say they don't know anything about the problem (Defra, 2009; Scottish Government, 2008).

2.1.1 Knowledge of the causes of climate change

There is more research into what is understood about the causes of climate change than on what people know about solutions. A significant minority of individuals do not see how their lifestyle contributes to the problem (Defra, 2009; Scottish Government, 2008). This is perhaps not surprising, given that knowledge of the causes of climate change is limited (Lorenzoni and Pidgeon, 2006; Whitmarsh, Seyfang, et al., 2011), although there could also be an element of denial involved here as a psychological defence against unpleasant feelings such as guilt (Doherty and Clayton, 2011; Opotow and Weiss, 2000). It is notable that several of the behaviours that survey respondents are least likely to recognise as causes of climate change are those that the public are least prepared to address in their own lifestyles (Anable et al., 2006); causality could run either way in this situation.

In a 1999 international survey, the most popular choice of response to the question about the main cause of climate change was "depletion of the Earth's ozone layer" (Leiserowitz, 2007b). This misunderstanding has emerged in many other studies over a significant time period (e.g. Bell, 1994a; Bulkeley, 2000; Leiserowitz, 2006; Lorenzoni et al., 2006; Lorenzoni and Pidgeon, 2006; Platt and Retallack, 2009; Stamm et al., 2000), although Reynolds et al. (2010) found that few respondents mentioned ozone depletion in 2009, unlike when they used the same questionnaire in 1992. While Bell (1994a, p. 33) regards this as "typical of comprehension meltdown between related topics", Thompson and Rayner (1998a, b) argue that it could be evidence that respondents characterise climate change and the ozone 'hole' as two examples/symptoms of the same problem: humanity's 'wrong' relationship with nature, and therefore that differences in the precise details of these issues are not relevant to them. They suggest that this indicates a moral basis to risk perceptions, rather than a complete lack of understanding.

Other studies that are interpreted as showing a lack of public knowledge of climate change causes suggest over-simplification on the part of the researchers. For example, Bord et al. (2000) and Read et al. (1994) report that aerosol spray cans and nuclear power were incorrectly identified as possible causes of climate change by some of their survey respondents. While it may be that most people who regard aerosol sprays as a problem do so because of confusion/conflation with the problem

of ozone depletion, chlorofluorocarbons in sprays have been replaced by other halocarbons that are GHGs, and therefore use of spray cans does have a (small) radiative forcing effect (McCulloch, 1999), which some respondents might be correctly identifying. Similarly, although nuclear fission does not produce GHGs, mining and transportation of uranium and building nuclear power plants does, so the identification of nuclear power generation as *a* cause (though not a major one) of climate change is arguably correct, though imprecise. Questionnaire design may also be problematic. For example, Nolan (2010) suggests that people underestimate the contribution of their own behaviour to causing climate change because few of her survey respondents agreed that "people heating and cooling their homes" is a major cause. It might be that respondents were thinking about the impact of (their) one home, rather than the aggregate impact of many homes.

However, people often do not understand the relative impact of different activities/appliances on GHG emissions (Hargreaves et al., 2010; McKenzie-Mohr, 1994). In particular, while driving a car is generally recognised as a contributor to GHG emissions (Bulkeley, 2000; Truelove and Parks, 2012), the significance of flying (Anable et al., 2006; Becken, 2007) and meat-eating (Truelove and Parks, 2012; Whitmarsh, Seyfang, et al., 2011) is underestimated, and people often assume that energy use of appliances is simply proportional to their size (Steg, 2008). Recycling, which has low potential for emissions reductions, is identified by a significant proportion of survey respondents as the action that would be most effective in reducing climate change (Downing and Ballantyne, 2007; Scottish Government, 2008), and is regarded by some people as offsetting high-carbon behaviours such as flying (Barr et al., 2010; Scottish Government, 2011).

2.1.2 Understanding the scale of the threat

Climate change is difficult to comprehend and often has little salience because it is a 'creeping problem', with impacts that are not (yet) directly experienced by many who are most implicated in the emission of GHGs (Kloeckner, 2011; Moser and Dilling, 2004). Thinking about it in terms of just one or two hazards leads to underestimation of the scale of the threat (Weber and Stern, 2011), and some people perceive a rise in global average temperature of 1–2°C as negligible and

unproblematic (Slocum, 2004). Incorrect mental models of processes also lead to faulty risk perceptions. For example, GHGs are equated with other forms of 'pollution' and therefore expected to clear quickly (Weber and Stern, 2011). Individuals also fail to understand that atmospheric concentrations of GHGs will continue to rise even if emissions are reduced, if emissions still exceed the rate of removal from the atmosphere (Sterman and Sweeney, 2007). Chen (2011) suggests that people use 'inappropriate pattern matching heuristics', treating climate change as an object rather than a process, and that the public needs help to understand the time lags and inertia associated with the climate system.

2.1.3 Understanding the language of climate change

Another problem is the specialised language used by scientists: some words used in connection with climate change have different 'lay' meanings, hence the general public may not comprehend why, for example, 'positive' feedback or an 'enhanced' greenhouse effect is something to be concerned about (Henderson-Sellers, 2011; Sterman, 2011). Public understanding of the term 'theory' (as a mere hunch) also differs from scientific usage (Henderson-Sellers, 2011; Nerlich, 2010). Scientific language is often abstract, which makes it more difficult to process and remember (Kearney, 1994), and even climate change reports designed for non-scientists, such as the *Summary for Policymakers* of the most recent report of the IPCC, contain unfamiliar units of measure (e.g. ppm; CO_2e), chemical formulae, jargon, and complex graphics, which make them difficult to understand (Sterman, 2011). Budescu et al. (2012) found that the probabilistic statements used in IPCC reports are consistently misunderstood by the public.

Despite the fact that some surveys (e.g. Norton and Leaman, 2004) treat the terms 'global warming' and 'climate change' as synonyms, there is evidence to suggest that they are understood differently by the UK public. Whitmarsh (2009b) found that 'global warming' is recognised by more individuals; is more associated with heat-related impacts, human causes, the greenhouse effect, and ozone depletion; evokes more concern; and is seen as more certain, whereas 'climate change' is more associated with a range of impacts, already observed impacts, and natural causes. She also found that more people think that individuals can take action to mitigate 'global

warming' than 'climate change'. Surveys for the Department for Environment, Food and Rural Affairs (Defra, 2007, 2009) show that more respondents think they know something about 'global warming' than about 'climate change'.

2.1.4 Doubt and 'denialism'

Despite the consensus among climate scientists that climate change is happening, is a serious threat, and is almost certainly caused mainly by human activities (Anderegg et al., 2010; Doran and Zimmerman, 2009; IPCC, 2007a; Oreskes, 2004), the public perception is that there is still disagreement among scientists over these issues (Ipsos MORI, 2008; McCright, 2007). Scepticism exists regarding trends (whether climate change is actually happening), attribution (whether it is primarily a natural or human-induced phenomenon), and impacts (with some sceptics arguing that climate change is harmless or beneficial) (Rahmstorf, 2005). To some extent this is due to an organised 'denialist' movement funded at least partly by the fossil fuel industry, and motivated by concerns for the welfare of the industry and an ideological objection to environmental regulations (Weber and Stern, 2011). Jacques et al. (2008) found that over 92% of 'environmentally sceptical' books published since the 1970s are linked to conservative think tanks (mostly in the USA), and that 90% of the websites of conservative think tanks espouse 'environmental scepticism'. They conclude that "Promoting scepticism is a key tactic of the anti-environmental counter-movement coordinated by conservative think tanks" (p. 364).

Dunlap and McCright (2011) contend that 'scepticism' – which properly refers to a doubting or questioning attitude – is not accurately applied to those who adopt an entrenched position rejecting the scientific consensus on climate change (and deliberately promoting public scepticism) using arguments that bear the hallmarks of 'denialism'. Denialists claim conspiracies, rely on 'fake' experts and denigrate real ones, are selective in their referencing of 'evidence', create impossible expectations about what research should deliver (e.g. a demand for absolute certainty regarding climate science, cf. Milbrath, 1995), and use misrepresentation and logical fallacies in their arguments (Diethelm and McKee, 2009). Anderegg (2010) recommends that climate scientists need to react quickly to media stories about climate change and make it clear who has expertise and who does not.

Shortly before the UN climate change conference in Copenhagen in December 2009, the media reported on hacked emails that appeared to discredit climate scientists; the introduction (by the sceptic/denialist newspaper columnist James Delingpole) of the term 'climategate' to refer to the controversy framed it in such a way as to immediately suggest wrongdoing and a cover-up (Nerlich, 2010). A UK poll found that 6% of the sample were less convinced about the risks of climate change because of "stories about flaws or weaknesses in the science"; belief that the risks of climate change and its possible consequences have been exaggerated increased from 22% in November 2009 to 36% in February 2010 (BBC, 2010). Research by Leiserowitz et al. (2010) concluded that the scandal had a significant negative effect on public opinion regarding climate change in the USA.

Doubts about climate change may also arise for other reasons. Griggs and Kestin (2011) assert that the recent decline in belief that climate change is happening is related not only to 'climategate' (and to the discovery of errors in one of the reports of the IPCC, also picked up on by denialists), but to the cold winter of 2010 in Europe and the USA, and the failure of governments to negotiate a post-Kyoto climate agreement, leading to a public perception that the problem cannot really be serious. While plausible, they did not test their hypotheses empirically, but confusion between 'climate' and 'weather' certainly exists (Bostrom et al., 1994), which could lead to short-term weather patterns (such as cold winters) being interpreted as evidence against climate change, while government policies that contradict key messages are problematic (Scottish Government, 2010).

Poortinga et al. (2011) found that in the UK, belief that the climate is changing decreased significantly between 2005 and 2010, from 91% to 78% answering 'yes'. Trend and attribution scepticism are less prevalent than uncertainty or scepticism about the impacts of climate change, and sceptical views are not held very firmly. They suggest that, rather than being related to lack of knowledge or understanding, scepticism is rooted in people's core values and worldviews, an issue explored in section 2.4.

2.1.5 Concern

Concern about climate change appears to be relatively widespread but fluctuating, and questionnaire results may depend on question wording and context. In a 2006 survey of 15 countries, the proportion of respondents who had heard of 'global warming' who said they worry 'a great deal' or 'a fair amount' about it varied from 93% in Japan to 53% in the USA (Pew Center, 2006). Table 2 (below) shows the results of that survey for Great Britain, compared with two other surveys of British adults. As can be seen, the study by Downing and Ballantyne (2007) reported a much higher proportion of people 'very concerned' about climate change than were found only a few months earlier to 'worry a great deal' about it, with only about half as many respondents unconcerned. It might be that 'worry' suggests a stronger or more active/frequent emotion than 'concern'. Alternatively, the fact that the Pew Center asked about global warming in the context of questions regarding other (non-environmental) global problems (such as bird flu and nuclear weapons), whereas the later study focused on climate change, may have had an effect (cf. Leiserowitz, 2007b, who makes a similar point about the difference between two surveys of American opinions on climate change).

Table 2: Concern about climate change in Britain

Question wording	Percentage of respondents			
	A great deal/very	A fair amount/ fairly	Only a little/not very	Not at all
How much do you personally worry about global warming? (April 2006)[a]	26	41	25	7
How concerned, if at all, are you about climate change, sometimes referred to as global warming? (August 2006)[b]	44	38	12	3
How concerned, if at all, are you about climate change? (May 2008)[c]	30	47	14	9

[a] Pew Center, 2006; [b] Downing and Ballantyne, 2007; [c] Ipsos MORI, 2008.

Table 2 appears to show a decline in concern about climate change in the UK, comparing the survey by Downing and Ballantyne (2007) to Ipsos MORI (2008). Ratter et al. (2012) reviewed research from Britain, other EU countries, Canada, Australia, New Zealand, and the USA and found that it all shows a recent decline in concern. However, having looked at the longer-term data available from the USA

('worry' about global warming has been tracked by Gallup annually for many years and fluctuates quite considerably), they concluded that the decline might be part of an intermittent oscillation driven by attention cycles, and that the trend could plausibly reverse in future years. Scruggs and Benegal (2012), on the other hand, argue that declining concern in both the USA and Europe is due to the global recession.

More consistent is the fact that people usually express more concern about other issues, such as the economy and terrorism, than about climate change (Defra, 2007, 2009; Lorenzoni and Pidgeon, 2006; Lowe et al., 2006; Norton and Leaman, 2004). In Scotland in 2008, 57% of respondents agreed with the statement "Climate change is an immediate and urgent problem", but 'Environment/climate change/global warming' was sixth out of the top ten responses to an open question regarding the most important questions facing Scotland, with just 12% of the sample mentioning it. However, when respondents were asked what they viewed as the most important issues facing the *world*, the environment was mentioned by almost three times as many people (35%) (Scottish Government, 2008). This reflects the fact that the impacts of climate change are often perceived as distant (Lorenzoni and Pidgeon, 2006), though Poortinga et al. (2006) found that 77% of their sample recognised risks to people in Britain from climate change.

2.2 Models of behaviour

Given the relatively high levels of concern about climate change that exist in the UK, as detailed in section 2.1.5, why have GHG emissions due to household consumption been rising rather than falling (Druckman and Jackson, 2009a), suggesting that lower-carbon behaviours are not being widely adopted? In one survey, 82% of respondents stated that they were 'very' or 'fairly' concerned, 78% said they 'strongly' or 'tend to' agree that they are prepared to change their behaviour, yet 37% reported that they are not doing anything to reduce climate change (Downing and Ballantyne, 2007). In this section I present selected models and theories of behaviour, using these as a framework to discuss several factors other than problem knowledge and concern that can influence whether PEB is adopted. There is an extensive literature on socio-psychological models of behaviour and a

comprehensive discussion is not attempted or necessary here. Instead I focus on models that have been particularly influential, or that illustrate important concepts. A more extensive overview is given by Jackson (2005).

2.2.1 The information-deficit model and the value-action gap

The earliest and simplest model of behaviour is the information-deficit model (Kollmuss and Agyeman, 2002), which posits that informing people about an environmental problem inculcates pro-environmental attitudes such as concern, which in turn lead to PEB (see Figure 2, below).

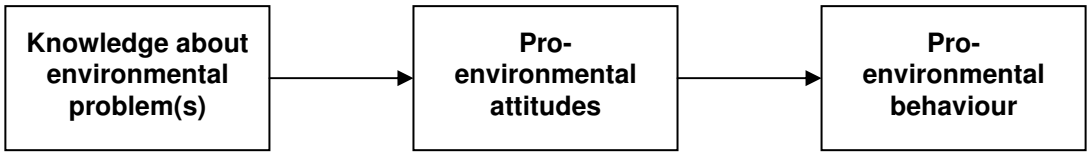


Figure 2: The information-deficit model of pro-environmental behaviour
Source: Based on a diagram from Kollmuss and Agyeman (2002).

Although one study found a negative correlation between self-reported knowledge and concern about climate change (Kellstedt et al., 2008), there is evidence that environmental problem knowledge *is* an important indirect determinant of PEB (Bamberg and Möser, 2007; Hines et al., 1986/7; Hungerford and Volk, 1990), although it is not always a prerequisite (Kempton et al., 1995, cited in Kollmuss and Agyeman, 2002). However, the information-deficit model has been widely criticised because pro-environmental attitudes often do not translate into PEB (e.g. Blake, 1999; Owens and Driffill, 2008; Southerton et al., 2011). This is known as the value-action (or attitude-behaviour) gap. Several studies have found that although environmental concern is correlated with PEBs that are low-cost in terms of time, effort, or money, concern is not a good predictor of more costly behaviours (e.g. Corraliza and Berenguer, 2000; Tobler et al., 2012; Urban and Ščasný, 2012; Whitmarsh, 2009a). Capstick and Lewis (2010) found that the size of an individual's carbon footprint does not correlate with his/her level of concern about climate change, and other studies suggest that household energy use is more related to socio-demographic characteristics such as household size and income (larger and higher-

income households use more energy in the home and for transport) than to attitudinal variables (Gatersleben et al., 2002; Poortinga et al., 2004).

It should be noted, however, that there have been criticisms of research that apparently demonstrates the value-action gap. Bamberg (2003) suggests that often the measures of environmental concern used are too general to predict engagement in specific PEBs, and that general concern should be seen as an indirect determinant of PEB through its role in forming situation-specific attitudes (cf. Hines et al., 1986/7, who found that attitudes towards taking action were a slightly stronger predictor of PEB than general environmental attitudes). Kaiser et al. (2010) argue that the attitude-behaviour gap does not exist as commonly conceived, because asking people about their attitudes does not really measure 'attitudes' but instead measures a type of behaviour: making, or agreeing/disagreeing, with evaluative statements. Where discrepancies occur between what people say and what they do, it is because of the differential difficulties of these two behaviours (expressing an opinion compared to taking action). They assert that one can infer individuals' environmental attitudes (and attitudinal strength) by examining their behaviour; a person who says she is concerned about climate change but engages in very few lower-carbon behaviours is assumed not to be very concerned in reality.

In some cases, the value-action gap may occur because environmental attitudes about a problem such as belief in the seriousness of the threat, concern, and a desire for action to be taken, are not the same as willingness to take action oneself. This may be because of beliefs that new technologies will solve the problem without the need for behavioural change (Hobson and Niemeyer, 2011; Oskamp, 2000) or that changing one's individual behaviour will have little or no effect on the problem, especially if others do not take action (Hargreaves et al., 2010; Heiskanen et al., 2010; Hinchcliffe, 1996; Semenza et al., 2008). Willingness to act may also vary with context: for example, individuals express less readiness to engage in PEB on holiday than at home (Barr, Shaw, et al., 2011; Barr et al., 2010; Becken, 2007).

2.2.2 The Theory of Reasoned Action, subjective norms, and behavioural intentions

One of the most influential theories of behaviour is the Theory of Reasoned Action (TRA; Ajzen and Fishbein, 1980; Fishbein and Ajzen, 1975), an adjusted

expectancy-value model. Expectancy-value models assume that individuals make rational choices based on self-interest: attitudes towards particular behaviours (not general attitudes/concern, as often measured with regards environmental issues) develop from beliefs about behavioural outcomes, and behaviours that have positive consequences for the individual are favoured (Jackson, 2005).

The TRA is adjusted to take account also of the influence of subjective norms (see Figure 3, below), i.e. the fact that individuals are strongly influenced by their beliefs about others' views regarding particular behaviours (Webb and Sheeran, 2006). Such views might be directly expressed, but are frequently inferred from what others do, often unconsciously (e.g. Aarts and Dijksterhuis, 2003; Grønhøj and Thøgersen, 2012; Nolan et al., 2008). Behaviour (change) influenced by subjective norms can lead to negative environmental impacts (e.g. beliefs about expectations of cleanliness that lead to more frequent personal and clothes washing; Shove, 2003) and prevent adoption of lower-carbon behaviours (Gifford, 2011). Equally, exposure to 'cultural rules favouring climate-relevant environmental action' makes it more likely that a person will be involved in such action (Jaeger et al., 1993).

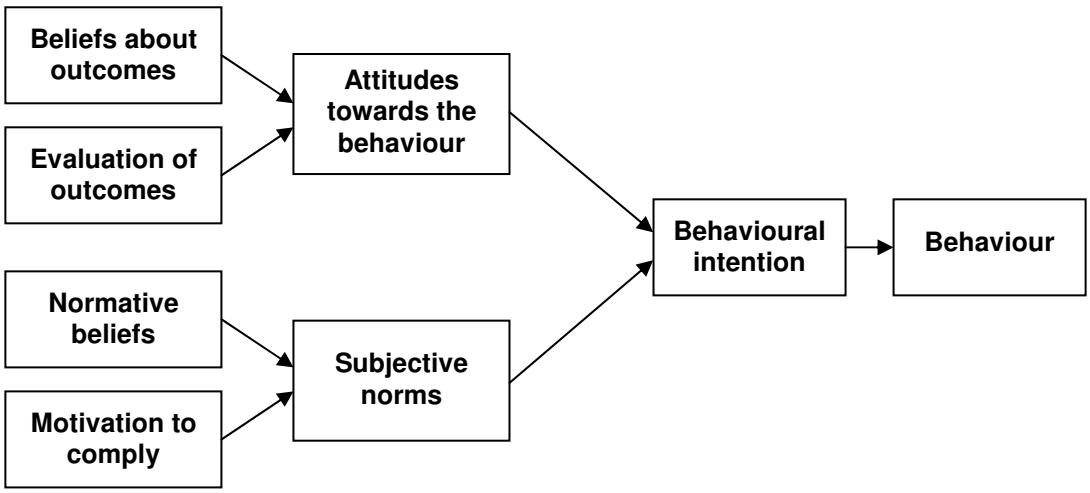


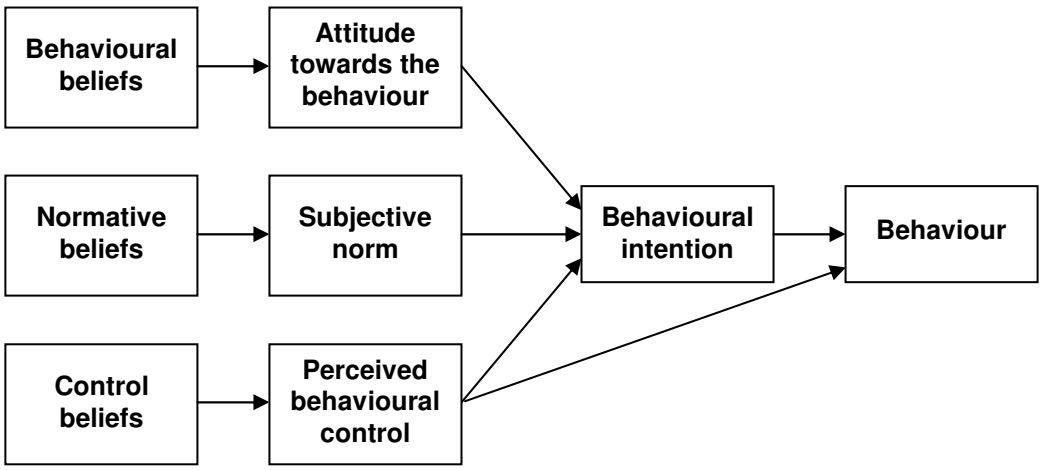
Figure 3: The Theory of Reasoned Action
Source: Based on a diagram from Kollmuss and Agyeman (2002).

In the TRA, the formation of a behavioural intention is a key determinant, and the immediate antecedent, of behaviour. A meta-analysis of determinants of PEB by Bamberg and Möser (2007) confirmed the importance of intention as a mediator of other factors, but there is little empirical evidence to support the assertion that

intentions are a good predictor of behaviour (i.e. intention is a necessary but not sufficient factor). Research participants frequently express intentions to adopt PEBs, either in response to stimuli such as a film or piece of information, or more generally in surveys of attitudes, but studies seldom attempt to determine whether these intentions are acted on (see, e.g. Gifford and Comeau, 2011; Leiserowitz, 2004; Morton et al., 2011; Stern and Dietz, 1994). When they do, it turns out that intentions often do not translate into action (e.g. Barr, 2006; Chan, 2001; Nolan, 2010). A meta-analysis by Webb and Sheeran (2006) of experimental evidence on intentions and behaviour from various fields concluded that intentions have only a small impact on behaviour, and are overestimated by correlational tests. They also note that action may cause intention, and that people may infer their intentions from their actions.

2.2.3 The Theory of Planned Behaviour and perceived behavioural control

One situation in which intentions do not lead to action is when individuals do not have complete volitional control. The Theory of Planned Behaviour (TPB) is an extension of the TRA that takes account of this (Ajzen, 1991; Ajzen and Madden, 1986), through inclusion of the variable 'perceived behavioural control' (PBC). This "refers to the perceived ease or difficulty of performing the behavior and it is assumed to reflect past experience as well as anticipated impediments and obstacles" (Ajzen, 1991, p. 188). The model's originators (Ajzen, 1991; Ajzen and Madden, 1986) regard PBC as essentially the same as Bandura's (1977a, 1982) concept of perceived self-efficacy: personal "judgments of how well one can execute courses of action required to deal with prospective situations" (Bandura, 1982, p. 122). PBC is conceived to be a direct influence on behaviour as well as an indirect determinant through its effect on intentions (see Figure 4, p. 41); individuals are likely to expend more effort to achieve a behaviour if they have a strong belief that they can do it (Ajzen, 1991). Empirical studies show that PBC/self-efficacy is a necessary condition for individuals to take action (Bandura, 1982; Grothmann and Patt, 2005; Ruiter et al., 2001), although one study found an unexplained negative correlation between PBC and PEB (Grob, 1995).



Behavioural beliefs = beliefs about outcomes of behaviour and evaluation of outcomes
Normative beliefs = beliefs about what others think one should do and motivation to comply
Control beliefs = beliefs about resources and barriers to action

Figure 4: The Theory of Planned Behaviour
Source: Based on the description given by Bamberg and Schmidt (2003).

The TPB has been used in various studies of PEB and proves to have relatively good predictive power, although the addition of other variables discussed later improves the model fit (see e.g. Bamberg and Schmidt, 2003; Klöckner and Blöbaum, 2010; Richetin et al., 2012). However, research often relies on self-reported rather than actual behaviour, and studies that compare self-reported and observed behaviour show significant differences between the two measures, with self-reported behaviour more closely related to attitudes and providing a misleadingly good model fit (Chao and Lam, 2011; Manfredo and Shelby, 1988).

One variable that increases predictive power when added to the TPB is 'descriptive norm' (Heath and Gifford, 2002), i.e. an awareness of what others do (which not only gives an idea of what others think about a particular behaviour, but also how difficult or easy it might be to perform). Studies suggest that although descriptive norms may play a role in creating subjective norms, as described above (section 2.2.2), they have an impact on behaviour distinct from 'injunctive' norms, which describe what others approve/disapprove of (Cialdini et al., 1990; Schultz et al., 2007). In this thesis I shall use the term 'social norms' to mean both descriptive and injunctive norms, rather than the term 'subjective norm', which does not explicitly recognise the separate influence of descriptive norms on behaviour.

2.2.4 The Norm Activation Model: responsibility and personal (moral) norms

One criticism of adjusted expectancy-value models such as the TRA and TPB is that individuals do not always act (purely) out of self-interest (Jackson, 2005). Several studies provide evidence that PEB is influenced by moral considerations (Bamberg and Möser, 2007). Schwartz's (1977) Norm Activation Model (NAM) was developed to explain pro-social, altruistic behaviour, and is used by researchers who regard PEB as motivated by concerns for others (Bamberg and Möser, 2007). The model posits that personal norms – feelings of moral obligation regarding one's behaviour – are the direct determinant of pro-social behaviour, and that these personal norms develop from an awareness of the consequences of one's behaviour (Schwartz, 1968) and ascription of personal responsibility for those consequences (see Figure 5, below).

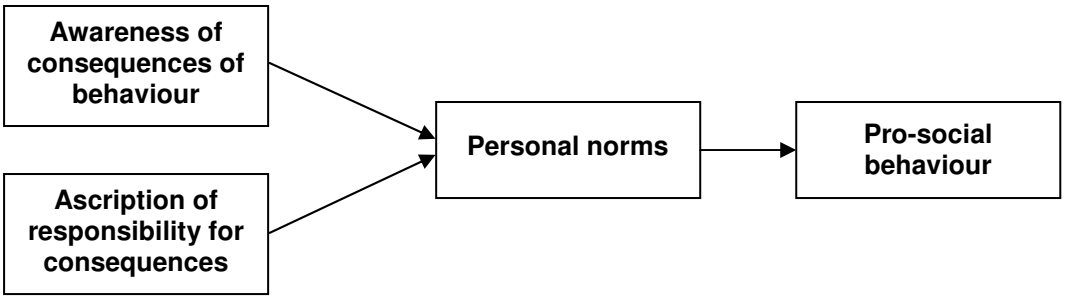


Figure 5: The Norm-Activation Model of pro-social behaviour
Source: Based on the description given by Bamberg and Schmidt (2003).

Tests of the NAM with regard to PEB have produced mixed results. Guagnano et al. (1995) report that the model predicted recycling behaviour for households without kerbside recycling bins, and Matthies et al. (2012) found it to be a good fit for re-use and recycling behaviours in children. In the domain of travel mode choice, Bamberg and Schmidt (2003) found that personal norms have little influence, whereas Klöckner and Blöbaum (2010) ascertained that the NAM has good explanatory power, though not as good as a more comprehensive model, and Bamberg et al. (2007) discovered that personal norm was a significant predictor of intention to use public transport along with other variables not included in the NAM.

As already discussed, some people do not have an awareness of the consequences of their behaviour for climate change (see section 2.1.1), and

psychological reactance (resistance because the information is perceived as a threat to behavioural freedoms) may be triggered by stressing such consequences (Schwartz, 1970). People also do not necessarily accept responsibility for the problem (Barr, Gilg, et al., 2011). A theme that frequently recurs in the literature is that individuals think that responsibility for leading mitigation action lies with the industrial/business sector and/or the government (e.g. Bulkeley, 2000; Hinchcliffe, 1996). Middlemiss (2010a) suggests that some of her interviewees do not understand the boundaries of their own responsibility for PEB, but responsibility is a value judgement and a contested political issue, not a matter of fact.

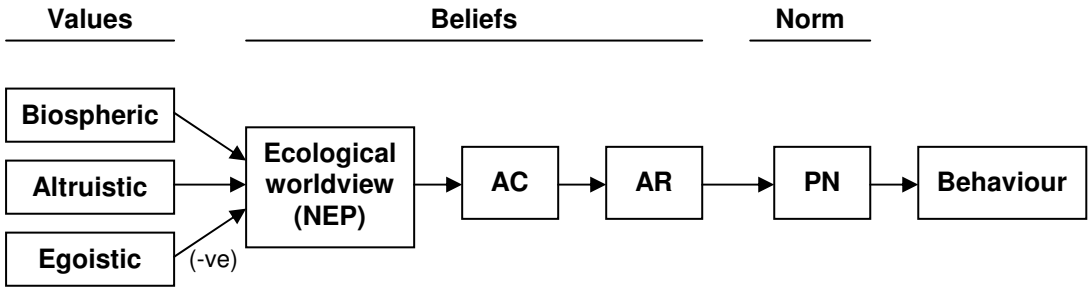
Bandura (2007) presents several mechanisms through which people disengage from moral obligations regarding environmentally-detrimental behaviour. These include: moral justification, exonerative comparison, and euphemistic labelling of behaviour; displacement and diffusion of responsibility; minimising, ignoring, or misconstruing consequences; and marginalisation/dehumanisation of, and attribution of blame to, victims.

2.2.5 Values as a basis for pro-environmental behaviour: Value-Belief-Norm theory

Studies show that pro-environmental attitudes, beliefs, and behaviour are influenced by individuals' values, especially those classified in Schwartz's (1992, 1994) influential Value Theory as belonging to the 'universalism' category (Karp, 1996; Schultz and Zelezny, 1999; Stern and Dietz, 1994). Values are defined by Schwartz (1992, p. 21) as "desirable transsituational goal[s] varying in importance" that act as "guiding principle[s] in the life of a person or other social entity." Stern and colleagues (Stern, 2000; Stern et al., 1999) have developed a Value-Belief-Norm (VBN) theory of pro-environmental behaviour that links value theory to the norm activation model.

This posits that PEB is a product not only of altruism (care for other people), as in the NAM, but also of biospheric values (care for the biosphere), while egoistic (care for self) values are a negative influence (Stern, 2000). Schwartz's values survey includes both altruistic and biospheric items to measure 'universalism', and studies have shown that these are distinct (de Groot and Steg, 2007, 2008; Schultz, 2000; Snelgar, 2006).

These values affect beliefs, which in turn activate personal norms, leading to PEB (see Figure 6, below). Beliefs include ecological worldview, measured using the New Ecological Paradigm scale (Dunlap and Van Liere, 1978; Dunlap et al., 2000), and awareness of adverse consequences of behaviour; Stern, Dietz, and Guagnano (1995) suggest these constructs relate to generalised beliefs about nature and human-environment interactions, which then influence attitudes and intentions regarding specific behaviours. Stern et al. (1999) tested the model and found that it was a better predictor of PEB than other theories they compared it to.



NEP = New Ecological Paradigm
AC = awareness of adverse consequences
AR = ascription of responsibility and perceived ability to reduce threat
PN = personal norm (sense of obligation to take pro-environmental actions)

Figure 6: The Value-Belief-Norm model of pro-environmental behaviour
Source: Based on diagrams from Stern et al. (1999) and Stern (2000).

Several studies show that positive childhood experiences 'in nature' (outdoors/ in 'natural areas') are formative influences on people involved in environmental education, activism, and jobs (e.g. Chawla, 1998a, 1999; Corcoran, 1999; Palmer et al., 1999; Tanner, 1980), which suggests that such experiences help develop biospheric values. Weinstein et al. (2009) demonstrate that 'immersion in nature' elicits 'nature connectedness', while Nisbet et al. (2009) found that a sense of connection with nature is correlated with environmental attitudes and (self-reported) PEB.

Oreg and Katz-Gerro (2006) suggest that VBN theory is limited because it only considers values at the individual level. They argue that 'country-level' values affect attitudes, and therefore that cultural context shapes individuals' actions. Similarly, Nilsson et al. (2004) found that an *organisation's* values are important determinants of public sector decision makers' views – in their working role – on climate change

mitigation strategies, and Nye and Hargreaves (2010) discovered that individuals in an 'Environment Champions' programme at work found it more difficult to make changes than people involved in 'EcoTeams' (a household-based project), because of different reactions and expectations in a work setting.

2.2.6 Attitudes-Behaviour-Context: the importance of situational conditions

Recognising the importance of the context in which people make decisions, Guagnano et al. (1995) and Stern (2000) propose the Attitudes-Behaviour-Context (ABC) model: PEB is a function of attitudes and contextual factors in combination (Figure 7, below).

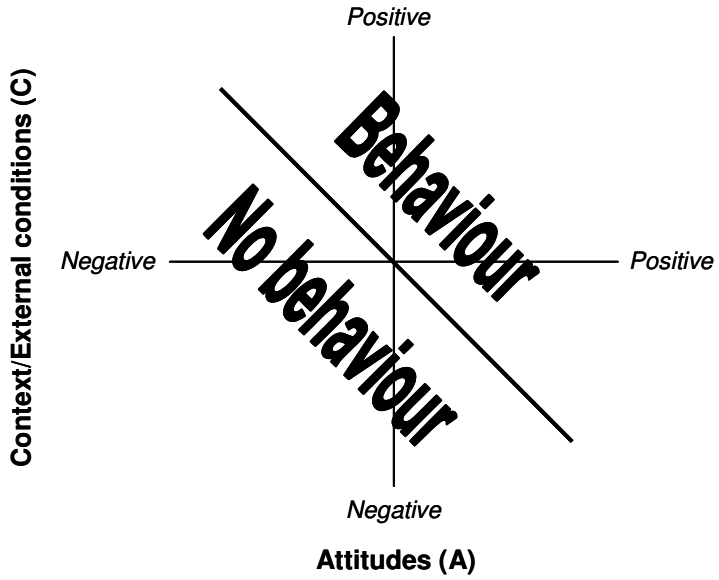


Figure 7: The Attitudes-Behaviour-Context model of behaviour
Source: Guagnano et al. (1995).

Contextual factors in this model are not limited to cultural or organisational values; they include material costs and rewards, laws and regulations, available technology, social norms and expectations, supportive policies, and advertising (Stern, 2000, p. 421). Sufficiently negative external conditions will prohibit action even if attitudes towards a behaviour are positive (Corraliza and Berenguer, 2000); conversely, a facilitating context will lead to PEB even in the absence of positive attitudes regarding it (Guagnano et al., 1995; Heath and Gifford, 2002). Ross (1977, p. 183) cautions that there is a "tendency for attributors to underestimate the impact

of situational factors and to overestimate the role of dispositional factors in controlling behaviour", a phenomenon known as the Fundamental Attribution Error.

Despite the essential insight that the ABC provides, Stern (2000) does not regard it as a comprehensive model of the factors affecting PEB, arguing instead that an understanding of personal capabilities and the force of habit is also necessary.

2.2.7 Habits, abilities, and locus of control

One model that incorporates both these additional factors is the Motivation-Opportunity-Ability model (Ölander and Thøgersen, 1995), a modification of the TRA that adds personal abilities (which includes habits, in this model), and the situational conditions that create or reduce opportunities to act, as moderators of intentions and behaviour (see Figure 8, below). Another important aspect of the model is the recognition that influences on behaviour are not one-way: the performance of practices/behaviours affects both abilities and beliefs relating to these behaviours (Hards, 2011a).

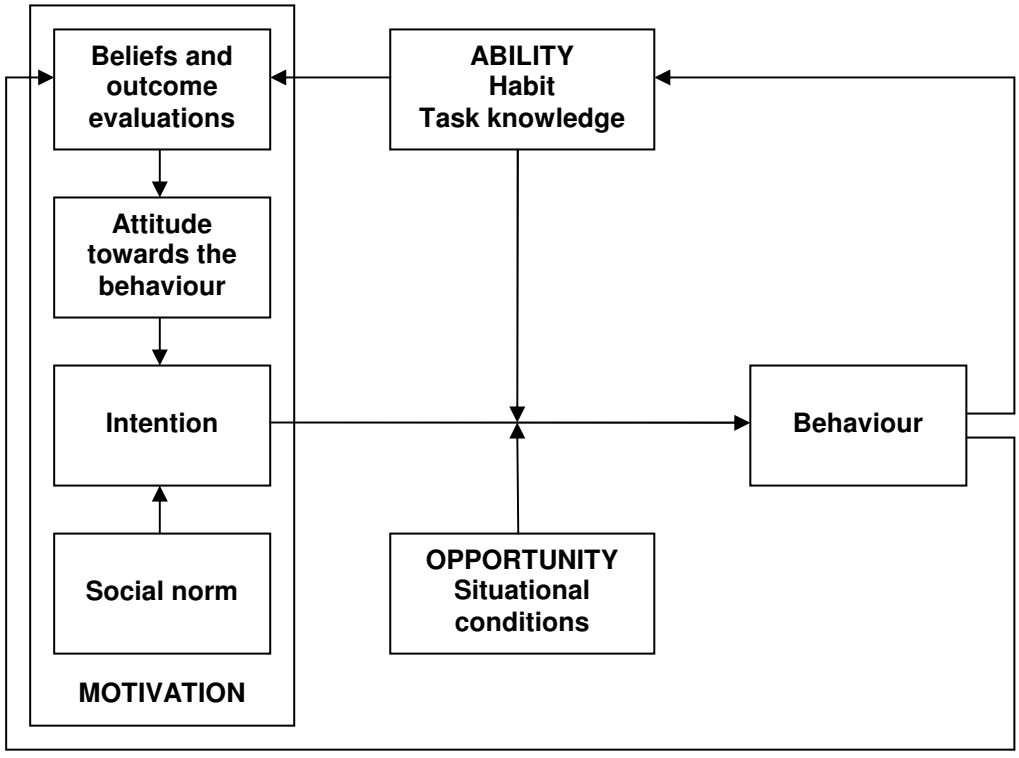


Figure 8: The Motivation-Opportunity-Ability model of behaviour
Source: Ölander and Thøgersen (1995).

The importance of habit in travel mode choice has been demonstrated by Bamberg and Schmidt (2003), and a meta-analysis of experimental behaviour change interventions by Webb and Sheeran (2006) found that interventions that changed behavioural intentions had less impact on behaviours performed frequently in stable circumstances (i.e. habitual behaviours) than on those performed infrequently and/or in unstable circumstances. Furthermore, Oeuellette and Wood (1998) show that habit strength is reflected in how frequently a behaviour has been performed in the past, and directly affects future performance.

'Task knowledge' is the other element of personal ability in this model. This is the knowledge required to take action (e.g. knowing where to buy locally-grown organic produce). It is not necessarily information we are conscious of; habitual tasks employ 'hidden' know-how that we are not aware of as we go about them (Hobson, 2003). Darby (2006a) found that this 'tacit knowledge' was an important determinant of energy efficiency/conservation measures taken by homeowners, with those who undertake more do-it-yourself projects (and therefore with more tacit knowledge regarding home improvement jobs) most likely to benefit from an energy conservation competition and install energy efficiency measures.

Arguably tacit knowledge (and task knowledge more generally) includes practical skills as well as cognition. In the model of Responsible Environmental Behaviour developed by Hines et al. (1986/7) from their meta-analysis of studies of variables associated with PEB, both 'knowledge of action strategies' and 'action skills' are explicitly included as factors influencing behaviour (see Figure 9, p. 48).

This model also incorporates the construct 'locus of control'. This is the perception of one's ability to bring about change – individuals with a strong internal locus of control believe that their actions make a difference (Kollmuss and Agyeman, 2002). This concept is included in VBN theory too, combined with ascription of responsibility for action (see Figure 6, p. 44); Hines et al. (1986/7) clearly differentiate the two factors. Roberts (1996) found that locus of control (which he called perceived consumer effectiveness) was the main influence on PEB, and other studies have also confirmed its importance (Allen and Ferrand, 1999; Hungerford and Volk, 1990). Kraus et al. (2009) demonstrate that individuals who perceive themselves as 'lower social class' have a reduced sense of personal control; this

could have implications for promoting lower-carbon lifestyles to people of lower socio-economic status.

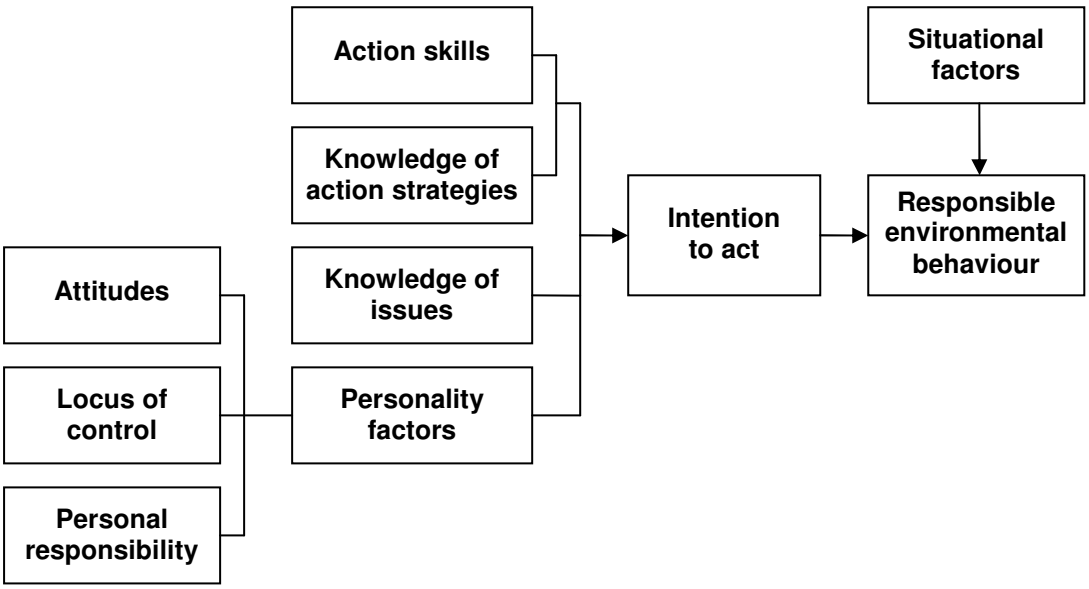


Figure 9: Model of Responsible Environmental Behaviour
Source: Hines et al. (1986/7).

2.2.8 The Theory of Interpersonal Behaviour, affect, roles, and identity

The Theory of Interpersonal Behaviour (TIB) developed by Triandis (1977, 1980) suggests that behaviour is influenced by both intentions and habit, moderated by 'facilitating conditions' (essentially the same concept as Stern's (2000) external contextual factors). In this model, intention is a function of attitudes, as in the TRA and TPB; emotions mediated by affect (feelings about particular objects, ideas, situations etc); and social factors, which includes roles and self-concept in addition to social norms (see Figure 10, p. 49).

The model is therefore one of very few that postulates that emotions play a part in our decisions, in addition to cognitive factors such as beliefs and attitudes. Grob (1995) confirmed empirically that emotions do influence PEB. However, there is considerable debate about the use of negative emotions such as fear to encourage behavioural change, discussed in section 2.5.3. The Climate Change Communication Advisory Group (CCCAG), an informal group of academics and practitioners, recommends that climate change communications should acknowledge the sense of

loss people feel about the behavioural changes necessary to mitigate climate change, as focussing only on the benefits is unconvincing (CCCAG, 2010). Psychotherapist Rosemary Randall cautions that negative emotions regarding climate change can be expressed in dysfunctional ways and seemingly unrelated behaviour (e.g. shopping to soothe anxiety; Randall, 2005); she created the Carbon Conversations programme in part to give people the opportunity to explore their feelings about climate change in a supportive group (Randall, 2009).

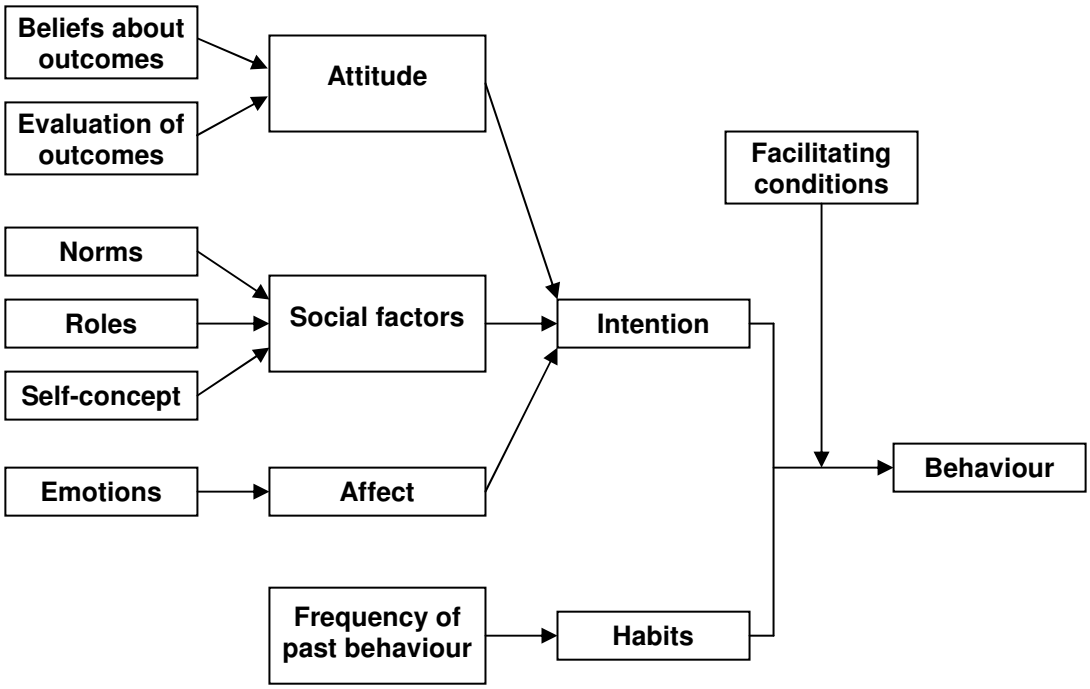


Figure 10: The Theory of Interpersonal Behaviour
Source: Jackson (2005).

Self-concept (or self-identity) refers to the idea a person has of him- or herself and the behaviours that 'the kind of person I am' does or does not perform, while roles are the behaviours that it is generally considered should be adopted by a person who holds a particular position in a group (Triandis, 1977). There is support in the literature for the proposition that identity motivates behaviour (Heimlich and Ardoin, 2008), but the two are not always consistent: Whitmarsh and O'Neill (2010) found that although pro-environmental self-identity was a predictor of some PEBs, it was also correlated with a high level of flying. Mullaney (2001) suggests that researchers should pay more attention to identities constructed on the basis of behaviours that

individuals do *not* (in some cases, have never) engage(d) in, currently largely ignored. Both identity and role beliefs are important factors in travel mode choice (Bamberg and Schmidt, 2003; Murtagh et al., 2010). Sometimes these concepts overlap; for example, one study found that the salience of individuals' identity as a parent was a significant contributor to travel choices, and that "Being a parent meant being a taxi for their children" (Murtagh et al., 2010, p. 17), which is a role belief associated with that identity.

The Scottish Government is currently using the TIB as a framework to identify the main influences on key behaviour areas in which they want to encourage behavioural change (Scottish Government, 2011).

2.2.9 Summary of factors affecting behaviour and barriers to PEB

Table 3 (p. 51) lists all the factors discussed here that might influence PEB. As can be seen, this is an extensive and varied list, suggesting that trying to encourage climate change mitigation action, or even to research the impacts of climate change communications and behaviour change interventions, is likely to be a very complicated task.

Attempts have been made to create comprehensive models of behaviour that take most of these factors into account. One example is Klöckner and Blöbaum's (2010) Comprehensive Action Determination Model of ecological behaviour (see Figure 11, p. 51), which they found explained 65% of the variance in students' travel mode choice, having greater explanatory power than the TPB, the NAM, and a combination of both. However, there is a trade-off between simple models that miss out behavioural antecedents, and more comprehensive models that may be too complicated for practical application (Jackson, 2005). Heimlich and Ardoin (2008), for example, comment that Fishbein's (2000; 2003) comprehensive Integrative Model of Behaviour Prediction is difficult to use because of its complexity.

Table 3: Factors influencing behaviour

Factor	Model in which introduced in this thesis
Knowledge	
- General problem knowledge	Information-deficit model
- Awareness of consequences of behaviour	Norm Activation Model
- Action (task) knowledge	Motivation-Opportunity-Ability model; Model of Responsible Environmental Behaviour
Attitudes	
- General (towards environmental problems)	Information-deficit model
- Specific (towards particular behaviours)	Theory of Reasoned Action
Behavioural intention	Theory of Reasoned Action
Social (subjective) norms	
- Injunctive norm	Theory of Reasoned Action
- Descriptive norm	Extension to Theory of Planned Behaviour
Perceived behavioural control (self-efficacy)	Theory of Planned Behaviour
Ascription of responsibility	Norm Activation Model
Personal (moral) norm	Norm Activation Model
Values	Value-Belief-Norm theory
Situational conditions: context and opportunities	Attitudes-Behaviour-Context model
Habit	Motivation-Opportunity-Ability model
Personal abilities (e.g. action skills)	Motivation-Opportunity-Ability model; Model of Responsible Environmental Behaviour
Locus of control	Model of Responsible Environmental Behaviour
Affect and emotions	Theory of Interpersonal Behaviour
Self-concept/identity	Theory of Interpersonal Behaviour
Roles	Theory of Interpersonal Behaviour

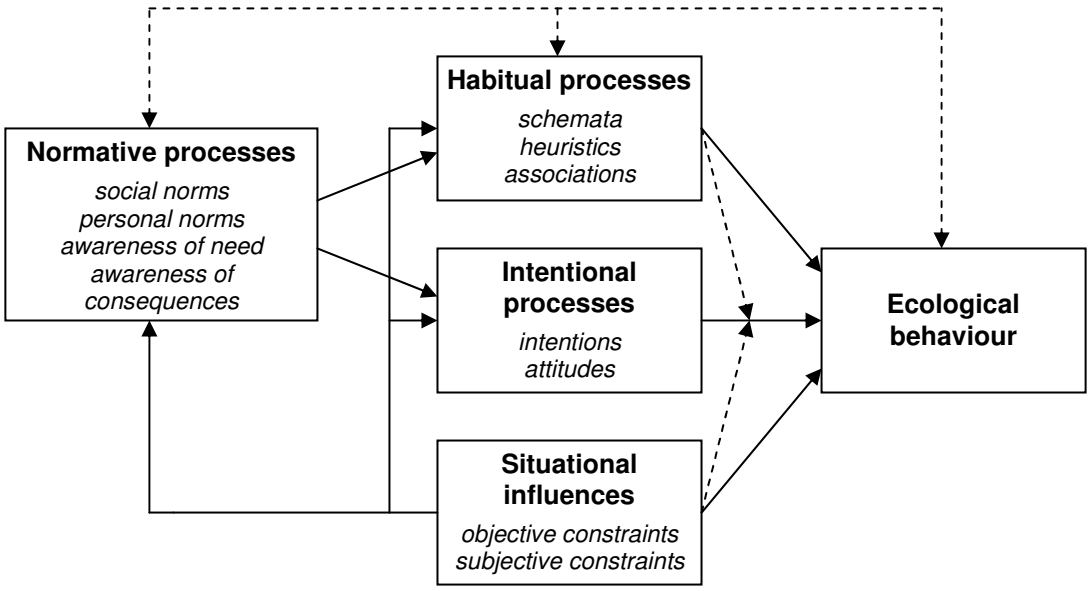


Figure 11: Klöckner and Blöbaum's Comprehensive Action Determination Model of ecological behaviour
Source: Klöckner and Blöbaum (2010).

This discussion of the factors affecting behaviour suggests that there are many potential barriers to PEB. These can be classified as individual or collective and subjective or objective barriers (Anable et al., 2006; Ballard, 2005). Figure 12 (below) lists barriers to behaviour that are implicit in the factors influencing behaviour shown in Table 3 (p. 51).

Individual subjective	**Individual objective**
Attitudes towards environmental problems generally and towards specific behaviours Low perceived behavioural control/self-efficacy Ascription of responsibility to others Personal (moral) norms Values External locus of control Emotions and affect Self-concept/identity	Lack of problem knowledge Lack of awareness of consequences of behaviour Lack of action knowledge Habits Lack of necessary personal skills/abilities Personal constraints on opportunity (e.g. lack of financial resources for home energy efficiency improvements)
Collective subjective	**Collective objective**
Problematic descriptive and injunctive social norms Expectations linked to roles	Inhibiting situational conditions such as lack of necessary infrastructure, technologies, and/or services; problematic policies, laws, and regulations

Figure 12: Barriers to pro-environmental behaviour

2.2.10 Practice theory and sociological critiques of psychosocial models of behaviour

Some sociologists are critical of models of behaviour of the type discussed above (including those that recognise the importance of socio-cultural structures and norms for behaviour), and they assert that climate change mitigation interventions focus too much on individuals (e.g. Moloney et al., 2010; Southerton et al., 2011; Strengers, 2012). They argue that practices such as showering and cooking should be the focus of attention, rather than individuals (Hand et al., 2005; Spaargaren, 2011). Individuals do not think of themselves as 'using energy' (for example), but as being engaged in practices (Hand et al., 2005; Røpke, 2009), and consumption is for the sake of these practices: "Items consumed are put to use in the course of engaging in particular practices like motoring and being a competent practitioner requires appropriate consumption of goods and services" (Warde, 2005, p. 145).

Reckwitz (2002, p. 250) defines a practice as "a routinized way in which bodies are moved, objects are handled, subjects are treated, things are described and the world is understood." Practice theory emphasises the routine and habitual nature

of much action, and regards ‘context’ and ‘habit’ not as external factors influencing behaviour, but as essential elements of practices, and the means through which they are reproduced (Shove, 2010).

Practices are regarded as having several elements, but there is no single theory of practice or schema of these elements (Gram-Hanssen, 2010; Warde, 2005). Common or similar elements identified by different authors include ‘things’, ‘products’, or ‘items of consumption’; ‘(practical) understandings’ or ‘competences’ (which includes skills and know-how); ‘rules’ or ‘procedures’; and the goals and meanings associated with practices (Gram-Hanssen, 2010). Reckwitz (2002, p. 250) asserts that “conventionalized ‘mental’ activities of understanding, knowing how and desiring are necessary elements and qualities of a practice in which the single individual participates, not qualities of the individual”, while Warde (2005, p. 137) stresses that similarities and differences in the possession and use of goods within and between groups of people “may thus be seen as the corollary of the way the practice is organized, rather than as the outcome of personal choice, whether unconstrained or bounded.”

Proponents suggest that practice theory points to different questions and directions for research than those that arise from a socio-psychological paradigm: for example, what types of practices are prevalent, what are typical combinations of practices, and how different practices affect one another (Warde, 2005); consideration of how needs and aspirations come to be as they are, through examinations of how practices develop and evolve (Shove, 2010; Shove and Walker, 2010); and what aspects of social, cultural, and technological structures (might) lead daily practices in sustainable directions (Gram-Hanssen, 2008). Becker (1953), for example, investigated how people learned to use and enjoy using a recreational drug, rather than what predisposes or motivates individuals to engage in smoking it, while Shove and Pantzar (2007) discuss recruitment to, and reproduction and transformation of, two leisure practices (photography and floorball). In the field of energy-related behaviour, Hand et al. (2005) consider how the practice of showering has changed, influenced by the technologies and meanings associated with the practice, and the evolving way in which it fits into daily routines. Gram-Hanssen (2008) gives examples of how household technologies have changed routines, such

as washing clothes now happening more often because machines have made the practice easier than hand-washing, while Shove (2003) explores how meanings (especially of 'normality') are reproduced by practices and influence them; for example, clothes being laundered to restore 'freshness' rather than because they are dirty.

Shove (2010, 2011) insists that practice theory represents such a fundamentally different paradigm to the approaches of social and environmental psychologists that it is incompatible with 'behaviour change' theories. Other academics suggest that she gives a simplistic portrayal of psychological models, and that her position excludes individuals from participation in enacting change; they argue that behavioural and practice perspectives can be combined to provide new insights (Whitmarsh, O'Neill, et al., 2011).

2.3 Processes of behavioural change

In addition to identifying the factors that influence behaviour, it is important to consider the *process* of change (Middlemiss, 2008). Therefore I now briefly discuss some theories and models of behavioural change that are influential in the domain of promoting PEB, or seem to have potential for this purpose.

2.3.1 Spillover and 'foot-in-the-door' theory

Government and NGO campaigns to promote PEB have often encouraged individuals to engage in 'simple and painless' actions, in the belief that this will lead to 'positive spillover': taking up other PEBs (Thøgersen and Crompton, 2009). Foot-in-the-door theory is a particular case of spillover. It asserts that adoption of an initial low cost behaviour (which is probably not very significant in terms of GHG reductions) can lead to engagement in more difficult and environmentally significant action (Thøgersen and Crompton, 2009).

There are various possible processes at work when spillover and foot-in-the-door effects occur. One theory is that the act of agreeing to an initial request, taking a small action, causes a person to have a particular self-perception, making it more likely that they will then agree to a further request and engage in other behaviours

because they see themselves as 'that kind of person' (Freedman and Fraser, 1966). Thus installing low-energy light bulbs might create or boost an individual's self-identity as 'someone who cares about the environment' and make that person more amenable to campaigns to save energy at home in other ways.

Secondly, the theory of cognitive dissonance (Festinger, 1957) is invoked: people may feel uncomfortable about the apparent contradiction of behaving in an environmentally responsible way in one domain of choice but not in another, although the less similar the behaviours are, the less likely that there will be a perception of inconsistency and consequent spillover (Thøgersen, 2004).

A third explanation for the effect is that engaging in one behaviour leads to acquisition of knowledge and/or skills that then makes it easier to adopt other behaviours (Thøgersen and Crompton, 2009).

Empirical research into spillover effects shows mixed results, with effects often small and occurring alongside negative spillover (e.g. Thøgersen, 1999; Thøgersen and Ölander, 2003). This is when the adoption of one behaviour makes the performance of another less likely, perhaps because people feel that they are 'doing their bit' (e.g. when recycling is considered to compensate for flying and driving; Barr et al., 2010). Similarly, Crompton (2008) argues that foot-in-the-door results are inconsistent, citing studies that show the effect to be small, undetectable, or operating in a reverse direction. A review by Burger (1999) also discovered conflicting evidence for the effectiveness of foot-in-the-door theory, and furthermore reveals that the second requests that experimental subjects are asked to comply with seem to be fairly undemanding compared to the kind of behavioural changes that individuals will need to make to significantly reduce their GHG emissions; this suggests that more research is necessary to discern whether initial small requests can actually lead, through the foot-in-the-door technique, to really effective changes.

Thøgersen and Ölander (2003) discovered that spillover is more likely to happen when people hold Schwartz's (1992, 1994) 'universalism' values (which include altruistic and biospheric values), or strong personal norms for PEB. Thøgersen and Crompton (2009) suggest that in order to optimise the likelihood of spillover effects, campaigns need to be clear about the environmental reasons for behavioural change, so that people develop a self-perception of acting for those

reasons (promoting behaviours for financial reasons will not help promote later actions that do not save money), and should also make explicit connections between PEBs since perceptions of similarity encourage spillover (Thøgersen, 2004).

2.3.2 The transtheoretical model

The transtheoretical model (TTM) of behavioural change has been very influential in the field of health-related behaviour (Horwath, 1999), and therefore it is worth considering whether it could be useful in promoting PEB too. The model is presented in Paper 3 (Chapter 6) and therefore a detailed explanation is not given here. Briefly, it posits that when engaging in behavioural change, individuals progress (not necessarily linearly) through five or six stages of change (Prochaska et al., 1992; Prochaska and Velicer, 1997). These range from precontemplation (prior to thinking about change), through contemplation, preparation, and action, to maintenance, or even in some cases termination, when the new behaviour has become so habitual that no effort is required to maintain it (see Table 16, p. 165).

Associated with these stages of change are ten different processes of change that can be employed to encourage and enable stage progression and behavioural change (Prochaska et al., 1992; Prochaska and Velicer, 1997). These include cognitive/affective processes such as consciousness-raising and 'dramatic relief' (emotional engagement with the issue), and behavioural processes such as substituting alternatives for the problem behaviour and instating costs and rewards (Table 17, p. 167). Different processes of change appear to be most useful at different stages of change, as shown in Table 18, p. 168 (Prochaska et al., 1992; Prochaska and Velicer, 1997).

Two further constructs of the model are decisional balance and self-efficacy. Decisional balance refers to the relative weight a person gives to the pros and cons of changing their behaviour. Progression from contemplation of change to actual action requires an increase in the evaluation of the benefits of the behavioural change, and a decrease in the evaluation of the drawbacks (Prochaska, 1994). Prochaska et al. (1994) suggest that an intervention should first target increasing the pros (perceived or actual) of behavioural change, because it is the step from precontemplation to contemplation that involves an increase in the evaluation of the benefits of change.

They found that this increase in the evaluation of pros is followed by a decrease in the weight given to the negative aspects of change, which aids progress from contemplation to action; therefore interventions at the contemplation stage should target decreasing the cons of behavioural change.

Self-efficacy, as already discussed in section 2.2.3 (p. 40), is a necessary antecedent of behavioural change, and DiClemente et al. (1991) show that individuals at later stages of change have a greater sense of self-efficacy than those at earlier stages.

Criticisms have been levelled at the validity of theoretical aspects of the TTM, and stage-based interventions have not always proved effective (Herzog et al., 1999; Rosen, 2000; Weinstein et al., 1998). However, the model has been used to design successful interventions to promote exercise and healthy eating, and to help people give up smoking (Spencer et al., 2006; Spencer et al., 2002; Spencer et al., 2007). Defra has used it to classify the stage of change that individuals have reached regarding certain PEBs, but not to design behaviour change interventions (Defra, 2009).

2.3.3 Ballard's 4A model of change for sustainability

Ballard (2005) proposes a model of the change process for sustainability that posits that there are three conditions for action. The first is awareness of the problem, the urgency of addressing it, and appropriate means of doing so. The second is agency; the ability to do something meaningful. The third condition is one that was not introduced in the models of behaviour discussed in section 2.2: association with other people, which Ballard considers "is at the heart of work for sustainable development" (p. 144). The *process* of change is a learning process involving cycles of action and reflection, during which individuals address the issues and barriers to change collectively. To this awareness–agency–association–action-reflection model, Darnton et al. (2006) add 'architecture' in recognition of the societal and organisational structures and processes that facilitate or prevent action, and that may be changed themselves in the process.

Ballard (2005) suggests several reasons why it is necessary that the process of change should be undertaken in association with others, including the validating

feedback on PEB that this offers, support for individual willpower, and the fact that a variety of perspectives on an issue can lead to better decisions. He argues that if individuals do not align themselves with others they will "probably be ignored and almost certainly become increasingly stressed and resentful" (p. 145).

Others propose additional reasons why connections with other people are important, including the opportunity to develop together an understanding of, and narrative about, consumption (Michaelis, 2007); democratising decision-making in future carbon reduction plans (Mulgetta et al., 2010); the development of the different kinds of capacity needed for action to reduce a community's ecological footprint (Middlemiss and Parrish, 2010); and sharing information (Gram-Hanssen, 2010; Thoyre, 2011). Heiskanen et al. (2010) explain how different types of groups increase agency, including place-based, sector-based, and interest groups, and 'smart mobs' that organise to buy products together in return for businesses agreeing to use a share of the profits for energy efficiency projects.

2.4 Who are 'the public'? Differentiation and segmentation of the population

The 'general public' is not a homogenous group. Differences in risk perceptions, attitudes, willingness to accept climate change mitigation policies, and personal behaviour exist and correlate with a range of socio-demographic and personality factors, and it is suggested that behavioural change messages and interventions should be tailored to audiences segmented in various ways, as discussed below.

2.4.1 Socio-demographic correlates of attitudes and behaviour

There is a lot of evidence for gender differences relating to environmentalism: women are more likely than men to believe that there is sound evidence for climate change (Borick and Rabe, 2010; McCright and Dunlap, 2011); express more concern about climate change (Semenza et al., 2008); hold stronger biospheric-altruistic values (Stern et al., 1993); and report more PEB (Olli et al., 2001; Roberts, 1996; Steel, 1996). However, one study discovered that although women are more likely to intend voluntary action to mitigate climate change, men are more likely to state

willingness to vote for climate change mitigation policies (O'Connor et al., 1999). These surveys were all carried out in the USA; a review by Zelezny et al. (2000) confirmed that stronger pro-environmental attitudes and behaviour among women are found in Spain and 13 countries in North and South America, but Urban and Ščasný (2012) found that studies in nine OECD countries reveal that although men express less environmental concern, there are no gender differences in domestic energy-saving behaviours.

Tanner (1999) shows that gender differences in driving frequency are explained by car ownership, and suggest that gender differences in PEB might be to do with opportunities rather than concern. Perhaps this could explain (at least in part) the finding that women undertake recycling activities more often (Diamantopoulos et al., 2003), if they deal with household waste more than men.

Zelezny et al. (2000) suggest that gender differences in PEB arise because of the greater socialisation females experience to be socially responsible and other-oriented. Given that studies generally rely on self-report measures of behaviour, there is arguably a question to be asked about whether women actually engage in more PEB, or simply report more because of the greater pressure they might feel to give socially desirable responses.

There are also age effects. Barr et al. (2005) and Roberts (1996) find that older people score higher for various types of PEB; Olli et al. (2001) report similarly, though the latter suggest that this is a cohort, rather than an age, effect. Regarding specifically climate change-related results, older people are reported to be more likely to state willingness to vote for climate change mitigation policies (O'Connor et al., 1999), and more likely to engage in energy saving behaviours (Jaeger et al., 1993; Urban and Ščasný, 2012), although Semenza et al. (2008) found that younger people were more likely to state willingness to change their behaviour to mitigate climate change. Tobler et al (2012) suggest that their discovery that older people are more willing to avoid using cars and planes is probably because they are less mobile than younger people. Studies do not always investigate interaction effects; it would be interesting to know whether correlations between age and PEB are still significant if the effects of home ownership and income are accounted for, since these factors affect the possibility of performing certain actions (e.g. installing insulation).

Fewer studies consider whether/how ethnicity correlates with environmental attitudes and behaviour. In the USA, Borick and Rabe (2010) and McCright and Dunlap (2011) find that whites are less likely to believe in the reality of climate change, while Kellstedt et al. (2008) report that research shows that ethnic minorities feel more concerned about the problem than white people.

The picture regarding educational level and PEB is mixed. Borick and Rabe (2010) report that in the USA, college-educated people are more likely to believe that there is strong evidence for climate change, but a Pew Center (2007) survey suggests that this depends on political views, with college-educated Democrats more likely than Democrats without a college degree to accept the evidence for climate change, but the reverse being true among Republicans. Also in the USA, people with more formal education are more likely to state willingness to vote for climate change mitigation policies (O'Connor et al., 1999) and to change their behaviour (Semenza et al., 2008); in the UK, people with a degree are more likely to be involved in political environmental action (Diamantopoulos et al., 2003). However, a review by Urban and Ščasný (2012) found that although higher levels of education are correlated with increased environmental *concern*, education plays no role with respect to actual domestic energy savings, and one study in Switzerland showed that people with higher levels of education were less willing than others to avoid using planes and cars (Tobler et al., 2012). Interestingly, Roberts (1996) reports that education is not a significant predictor of PEB once a measure of 'perceived consumer effectiveness' is taken into account, suggesting that education may have an effect on behaviour because it is related to increased self-efficacy and an internal locus of control.

As mentioned in Chapter 1, income is positively correlated with CO_2 emissions (Druckman and Jackson, 2009b). Higher income individuals express less concern about climate change (Semenza et al., 2008); use more energy at home and for transport (Poortinga et al., 2004); and are less likely to perform energy curtailment behaviours, although they are more likely to invest in energy efficiency measures (Urban and Ščasný, 2012).

We have already seen an indication that political orientation affects beliefs about climate change. This is a particularly pronounced effect in the USA, where

there has been a widening gap between Democrats and Republicans in terms of attitudes and beliefs about climate change in the last few years (Dunlap and McCright, 2008), with Republicans significantly more likely to adopt 'denialist' positions than Democrats (Borick and Rabe, 2010; McCright and Dunlap, 2011; Pew Center, 2007). Feygina et al. (2010) argue that a preference for the *status quo* explains the so-called 'conservative white male' effect of denial of environmental problems. In the UK, Barr et al. (2005) found that individuals they categorised as 'committed environmentalists' were most likely to vote Green or Liberal Democrat, and most likely to vote of all their respondents, while in Switzerland, right-wing voters are less willing to perform 'indirect climate-friendly behaviours', change their mobility behaviours, and support climate change mitigation policies than others, but low-cost mitigation action is not influenced by political affiliation (Tobler et al., 2012).

Overall, despite evidence of some correlations, the link between demographic variables and PEB is weak (Diamantopoulos et al., 2003; Hines et al., 1986/7; Roberts, 1996). This is probably largely because even those who show concern about climate change do not take much mitigation action. What this research is useful for is giving an understanding that risk perceptions *do* vary among the 'general public'; therefore messages about climate change are likely to be received differently by different segments of the population.

2.4.2 Cultural theory and myths of nature

Another way of segmenting the population is cultural theory, which asserts that there are different 'cultural types' of people, differentiated by whether they have a preference for – or feel bound by – strong or weak 'grid' features of society (rules and hierarchical structures), and strong or weak 'group' features (ties to others; sense of community). Many authors recognise four cultural types (e.g. Leiserowitz, 2006; Lowe, 2006; Steg and Sievers, 2000), generally named hierarchists, egalitarians, individualists, and fatalists; in more populist language, Marshall (2007) calls these types traditionalists, strivers, winners, and survivors respectively. The theory posits that each type has a different view (or 'myth') of nature (Thompson and Rayner, 1998a explain the provenance of this element of the theory), and a different

management style for dealing with environmental (and other) problems (see Figure 13, below). Some researchers (Leiserowitz, 2004; Lowe, 2006) associate particular views on climate change with these myths, while Dake and Thompson (1999) showed that different cultural types demonstrate different patterns of consumption (testing hypotheses developed from what the theory says about the preferences of the cultural types for different kinds of social interactions with different meanings). These views and consumption patterns are detailed in Figure 13.

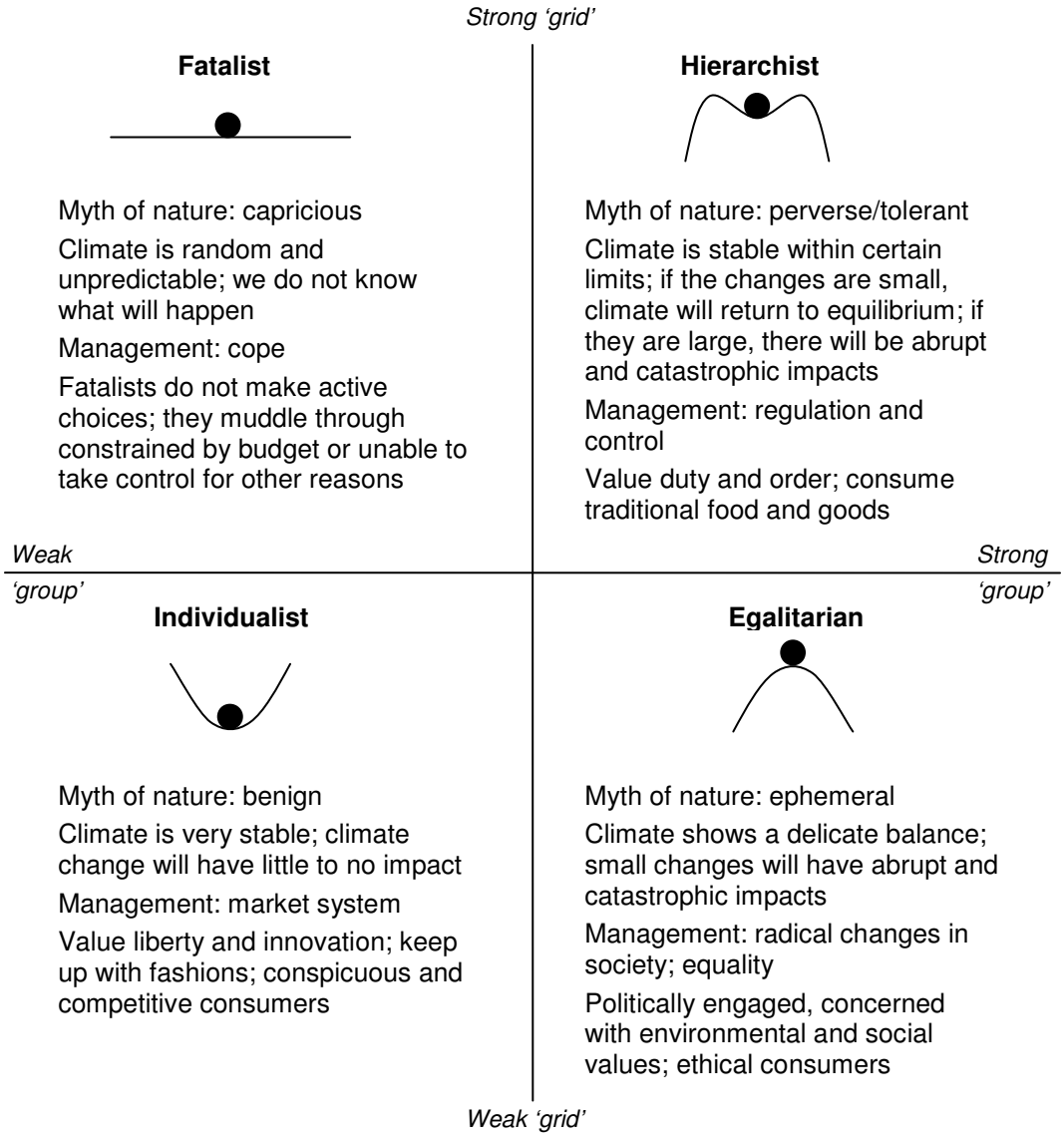


Figure 13: Cultural theory and myths of nature
Sources: Based on diagrams and information from Leiserowitz (2004), Michaelis (2007), and Steg and Sievers (2000).
Note: The diagrams in this figure represent the view of nature held by each type.

A fifth cultural type is sometimes recognised: hermits, who choose to be independent of social expectations, and often live simply, but not for political or moral reasons like egalitarians (Dake and Thompson, 1999; Michaelis, 2007).

Cultural theory and the associated myths of nature can help explain why individuals vary in their perception of the risks of climate change (Hulme, 2009; Thompson and Rayner, 1998b). It also suggests that different messages are needed to motivate individuals to adopt lower-carbon lifestyles, depending on their consumption preferences (Marshall, 2007; Michaelis, 2007), a theme we will return to in section 2.5.2.

Empirical support for the theory comes from Steg and Sievers (2000), who discovered that individuals who regard nature as 'ephemeral' (the egalitarian view) showed more awareness of the problems of car use, felt more responsibility for those problems, were more likely to agree that reducing car use is necessary, and stated more support for policy measures to reduce car use than other types, particularly those who view nature as 'benign' (the individualist view), although no significant differences were found between the types when it came to average annual distance travelled driving a car. Leiserowitz (2006) found that egalitarianism correlated positively with climate change risk perceptions and support for tax and other policies to mitigate climate change, but was not able to create satisfactory measurement scales for hierarchism and individualism. Heiskanen et al. (2010) use the theory to suggest how the structure of different types of climate action groups may help or hinder their mitigation efforts.

2.4.3 Other population segmentation models

Various other differentiation and segmentation models have been proposed, though they have so far not received as much attention as cultural theory or the influence of socio-demographic variables on pro-environmental attitudes and behaviour.

Kemp (2010), for example, highlights a values-based model of 'pioneers' (40% of the population), who are inner-directed and concerned with ethics, exploration, and innovation; 'prospectors' (another 40% of the population), outer-directed and driven by their need for esteem, interested in wealth, status, and image; and 'settlers'

(20% of the population), who desire security and give priority to home, family, and community. These three 'motivational groups' are further subdivided into twelve 'value modes', each with slightly different concerns and priorities; the theory is that individuals move across value modes during their lifetime, but the type they are at any given time will influence their behaviour across different domains of action.

By contrast, other models focus on attitudes towards, and engagement with, specific behaviours or groups of behaviours. Anable (2005), Duddleston et al. (2005), and Jensen (1999) segmented people in England, Scotland, and Denmark respectively according to their travel-related attitudes and behaviour, identifying segments ranging from 'die hard/passionate drivers' to 'car-less crusaders' (or 'cyclists/public transport users of heart') and 'reluctant riders' (public transport users by necessity), each with different characteristics in terms of their feelings and beliefs about travel mode choice, especially cars. Another study segmented 'energy consumers' based on purchase- and curtailment-related energy saving behaviours, acceptance of policy measures, and energy-related psychosocial factors, and identified six groups including idealists, materialists, those who are convenience-oriented and indifferent, and individuals who are problem-aware but well-being-oriented (Sütterlin et al., 2011).

Featherstone et al. (2009) used climate change as a case study to test a 'situational model' that segments people into eight types of 'issue-based publics', from those who are active to those who are completely disengaged from the issue. An individual might be part of one public on one issue but a completely different public on another. They found that, with minor adjustment, the model was relevant in segmenting people according to their engagement with the issue of climate change.

Defra has defined its own model of the UK population, segmenting individuals into seven groups relating to their willingness and ability to engage in PEB, including 'positive greens', 'waste watchers', 'concerned consumers', 'sideline supporters', 'cautious participants', 'stalled starters' and 'honestly disengaged' (Defra, 2008a). The Welsh Government has also been developing a sustainability segmentation model (Ipsos MORI, 2011).

Although researchers and campaigners often stress the need to tailor climate change messages and interventions to different segments of the population, the

theory and strategy is not without criticism. Anable et al. (2006) mention that models can be criticised for being static, and suggest that it is necessary to gain an understanding of how segments evolve over time. Corner and Randall (2011) advance the more fundamental objection that segmentation emphasises differences between individuals, rather than reconciling them, which they argue could be problematic because such an approach does not promote social capital, and could be self-fulfilling.

2.5 Mass communication about climate change and lower-carbon lifestyles

We have seen that factual information about climate change is not sufficient to motivate mitigation action, but that various types of knowledge are often important indirect influences on behaviour (section 2.2). Therefore it is necessary to consider how messages about climate change and mitigation action are communicated, and how this might be done better by governments and NGOs wishing to promote lower-carbon lifestyles.

2.5.1 News media coverage of climate change

Given the prevalence of the news media, it seems likely that most adults receive a significant proportion of their information about climate change from these sources. There has been a rise in coverage in both the USA and the UK in recent years (Boykoff, 2007, 2008; Doulton and Brown, 2009). There are strong correlations between patterns in media attention to climate change and shifts in awareness of the issue (Nisbet and Myers, 2007), and increased coverage leads to increased (short-term) public concern (Trumbo and Shanahan, 2000). Hart and Leiserowitz (2009) found a significant positive correlation between changes in media coverage of the film *The Day After Tomorrow* and variations in information-seeking activity on climate change-related websites.

Unfortunately, media coverage is not always accurate. Bell (1994b) discovered that in New Zealand, one story in six in a six month period contained significant misreporting of the problem, with some stories overstating the advance of climate change or confusing the greenhouse effect with ozone depletion, while Weingart et

al. (2000) state that in Germany, the media tended to translate uncertainties into certainties. More recently, the problem has often been that journalistic norms regarding 'balanced' reporting have led to climate sceptic views being given undue prominence; for example, Boykoff (2007) shows that coverage during 2003 and 2004 in the 'quality press' in the USA significantly diverged from the scientific consensus regarding climate change, while Freudenburg and Muselli (2010) found that climate science was more than twenty times more likely to support the idea that consensus assessments, such as those produced by the IPCC, *underestimate* the problem, rather than overestimating it as USA newspapers biased against reporting IPCC findings claim. As there is now a group of scientists – many of whom have been involved in the IPCC process – who argue that the IPCC tends to underestimate the severity of some climate change-related phenomena (Bray, 2010), Freudenburg and Muselli (2010) argue that the scientifically-legitimate 'other side' to the story about climate change is that climate change impacts may be significantly worse than consensus-based assessments conclude.

Having said this, coverage of climate sceptic positions declined in the USA quality press from 2005, and is no longer a feature of UK broadsheet newspapers (Boykoff, 2007); anti-action discourses that were prevalent in the right-wing papers *The Telegraph* and *The Times* died out around 2006/7 (Doulton and Brown, 2009) – although these studies were conducted before the so-called 'climategate' affair and there are still 'climate sceptic' newspaper columnists writing opinion pieces.

Much of the media representation of climate change has a fear and doom tone, concentrating on potential catastrophe (Boykoff, 2008; Doulton and Brown, 2009). Cohen (2011) discovered that a 'war on climate change' metaphor first appeared in Anglophone and UK newspapers in 2004 and usage is on the rise. Ereaut and Segnit (2006) found that 'alarmism' was one of the dominant discourses in UK media, though a year later it had largely become 'sober alarm' (Segnit and Ereaut, 2007). As regards lower-carbon lifestyles, 'take small actions' was the dominant discourse (Ereaut and Segnit, 2006).

Apart from the fact that catastrophe narratives may be disempowering (Shanahan, 2007), there are other issues with the framing of climate change stories in the media. Most discourses portray developing countries simply as needing our aid

and do not give a voice to poor people, who are presented as helpless victims with no agency (Doulton and Brown, 2009). The news media also tend to use very moralistic, judgemental language and religious metaphors (e.g. 'carbon sins') when reporting about lower-carbon lifestyles, even in stories about activists who avoid such language themselves (Nerlich and Koteyko, 2009; Randall, 2005). Other metaphors, such as the 'gold rush', 'Wild West', and 'cowboy' imagery used about carbon offsetting and emissions trading systems contain tacit assumptions and connotations, and frame these schemes in particular ways (Nerlich and Koteyko, 2010). Finally, the media contain very mixed messages, with stories about climate change next to advertisements for high-carbon goods and services, or even jeopardised by the need for advertising revenue; in the USA, car and fuel companies have threatened to withdraw advertising after radio stations reported on climate change (Shanahan, 2007).

2.5.2 Making climate change communications engaging and personally relevant

Climate change communicators are advised to make messages attention-catching, memorable, and inspiring by using images (Futerra, 2005; Nicholson-Cole, 2005; O'Neill and Hulme, 2009), stories (fiction, case studies, or analogies; Kearney, 1994), and vivid, concrete language (McKenzie-Mohr, 1994; Moser and Dilling, 2004). Platt and Retallack (2009) advise using the term 'carbon pollution' (which has a dirty image) to overcome the problem that the phrase 'CO_2 emissions' relates to something invisible; similarly, Corner (undated) suggests using 'air pollution' because this has concrete negative connotations, and ecoAmerica (2009) advocate talking about 'our deteriorating atmosphere' rather than 'climate change' or 'global warming', in addition to framing power generation in terms of 'dirty coal', 'dangerous nuclear', and 'clean, safe energy' from renewables. Stibbe (2009) argues that for many people the discourse of 'sustainability' is perceived as too economics-oriented, formal, and bureaucratic to be appealing, but that it is possible to promote sustainability without using this word.

Weiler et al. (2012) discovered that in the USA, PhD climate researchers have personality types different to the general population, in ways that make it likely that the public have more need than climate scientists of concrete information that

progresses from the current situation to potential future impacts without leaps. Uncertainty destabilises co-operation, so it is necessary to emphasise what is certain about climate science while acknowledging the uncertainties that remain (Raihani and Aitken, 2011). Budescu et al. (2012) show that a dual verbal-numerical scale of probability would improve communication of IPCC information, making it less likely to be interpreted according to the reader's opinions about climate change. Others also suggest that the public do not use factual information as climate scientists think they will, and that the latter should work with social and decision scientists in dedicated climate change communication teams to convey information effectively and make it relevant to different audiences (Fischhoff, 2011; Nisbet and Mooney, 2007).

One frequent suggestion is to highlight potential local and regional climate change impacts so as to make the information more personally/locally relevant (e.g. Leiserowitz, 2007c; Lorenzoni et al., 2006; Moser, 2008). Participants in a study by Nicholson-Cole (2005) said that local/national images of climate change are more moving than others, but O'Neill and Hulme (2009) found that when presenting individuals with climate change 'icons', the most local one (an image of the Norfolk Broads) provoked mixed opinions, with some respondents commenting that it was too local and not important enough to command attention or motivate concern about potential climate change impacts the area might suffer. Spence and Pidgeon (2010) and Uzzell (2000) also show that local impacts are not perceived to be as serious as more distant effects, but this is not necessarily an argument for focussing on the latter, as severe global-level environmental problems leave people feeling powerless (Uzzell, 2000).

Research by Maibach et al. (2010) suggests that an alternative way to make climate change more relevant to people is to draw attention to the potential health implications of the issue and the health benefits that might follow from specific mitigation policies.

Another common recommendation is that climate change communications – especially those promoting lower-carbon behaviours – should be framed so as to appeal to the different values and consumption preferences (identified, for example, by cultural theory) held by different people (e.g. Marshall, 2007; Michaelis, 2007;

Schultz and Zelezny, 2003). However, Crompton (2008) argues that messages designed to appeal to those who value status and fashion will be counter-productive in the long run because they will reinforce values that are incompatible with sustainability; the salience of self-transcendent values is likely to be reduced by focussing on self-enhancing, individualistic values that are inimical to PEB (Corner and Randall, 2011). Similarly, communications that emphasise the financial benefits of certain climate change mitigation actions could lead to a rebound effect if individuals use their savings on other carbon-intensive behaviour because the reason for making the savings was not to reduce GHG emissions (Crompton, 2008).

2.5.3 Fear appeals and loss versus gain framing

Yet another suggestion is that messages about environmental problems should appeal to people's emotions, rather than simply the intellect (e.g. Huddy and Gunnthorsdottir, 2000; Pooley and O'Connor, 2000). Many climate change communications, in common with the media reports discussed above, have focussed on potential disastrous impacts in an appeal to fear to motivate mitigation action; the DECC television advertisement mentioned in Chapter 1 is a prime example. There is quite a lot of evidence that fear appeals effectively promote concern and behavioural intentions (e.g. Meijnders et al., 2001a, b; Roser and Thompson, 1995; Sherer and Rogers, 1984), but that this does not necessarily lead to actual action (Leventhal et al., 1965; O'Neill and Nicholson-Cole, 2009). Moreover, much of the evidence for the positive effects of fear appeals comes from lab-based experiments, which have drawbacks; field research reveals weaker effects and unintended consequences (Hastings et al., 2004).

One issue is that people often need to feel a sense of *personal* threat for a fear appeal to work (Das et al., 2003); climate change tends to be seen as a problem that will affect other people far away and/or in the future (Lorenzoni and Pidgeon, 2006; ONS, 2011) and there is little perception of personal risks (e.g. regarding home flooding; Bichard and Kazmierczak, 2012). Also, according to Protection Motivation Theory, a crucial element of a successful fear appeal is that those it is intended to motivate must believe in the efficacy of suggested protective responses (Rogers, 1975) – a good reason to avoid catastrophe discourses coupled with 'small actions'

messages. Ruiter et al. (2001, p. 613) argue that "Current models do not adequately distinguish between emotional (i.e. fear arousal) and cognitive (i.e. threat perception) responses to fear appeals, and, in general, are not well supported." They suggest that perceptions of action effectiveness *and* self-efficacy (both elements of agency) are more important than fear arousal when it comes to behavioural change. Individuals dislike feeling helpless (Kaplan, 2000) and in the absence of agency, fear can trigger denial, avoidance, apathy, repression, anger, reactance, and maladaptive defensive responses (Moser and Dilling, 2004; Witte and Allen, 2000). Messages therefore need to contain useful, *specific* information about how to mitigate the threat (Leventhal et al., 1965; Lewis et al., 2010); Vasi and Macy (2003) advocate including information about successful conservation efforts in communications about environmental problems.

In the USA, Feinberg and Willer (2011) found that 'dire messages' about climate change conflict with 'just world' beliefs, and therefore lead to increased scepticism. Fritsche and Häfner (2012) show that inducing a perception of 'existential threat' reduces individuals' motivation to protect the natural environment for its intrinsic value (though not for its value to humans); i.e., under conditions of threat, PEB might be reduced if it is motivated by ecocentric concerns.

The Climate Change Communication Advisory Group recommends avoiding the use of fear appeals (CCCAG, 2010); Hastings et al. (2004) propose that social marketing campaigns can instead use humour, post-modern irony, and messages that positively reinforce 'good behaviour'. Platt and Retallack (2009) also advise satirising high-carbon behaviours, using humour rather than fear to make these less attractive.

Similar to the reasoning behind the use of fear appeals, but coming from classical economics, is the theory that individuals are more averse to loss than they are attracted by equivalent gains, and therefore that climate change communications should be framed in terms of potential losses (Gowdy, 2008; McKenzie-Mohr, 1994). However, studies show that, when it comes to climate change, the theory does not hold and individuals respond better to positive, or gain, frames than to messages that emphasise negative impacts if climate change is not tackled (Maibach et al., 2010; Morton et al., 2011; Spence and Pidgeon, 2010). Morton et al. (2011)

demonstrate that positive framing is better when uncertainty exists – as it does regarding climate change impacts – because it increases efficacy. Similarly, Gifford and Comeau (2011) found that presenting messages about lower-carbon behaviours using a 'motivational' frame (emphasising collective endeavours and potential benefits of action) increased self-efficacy and pro-environmental behavioural intentions more than messages that focus on 'sacrifices' that individuals need to make to mitigate climate change.

2.5.4 Messengers

In addition to consideration of how to frame messages, there is the question of who the messenger should be. Messages are given more weight if they are conveyed by people who are perceived to have authority (Dolan et al., 2012), or to share the same worldview and values as the recipient(s) (Kahan, 2010). Feelings of like or dislike for a messenger also affect how the message is received (Cialdini, 2007). Many authors (e.g. Ereaut and Segnit, 2006; Moser, 2008) advocate using messengers trusted by the audience; Moser (2006) proposes identifying people who have gained the confidence of their community and recruiting them to convey messages about climate change, and Christie et al. (2010, p. 6) suggest that the UK government might put more effort into "indirect influencing via trusted third parties in civil society" while faith in politicians remains low. A report on a home energy conservation trial found that "residents will take more notice of messages about energy saving coming from their peers than from the council" (Brent Council, 2011, p. 10). Similarly (but looking to people being more than messengers), Alexander and Ballard (2005) and Darnton et al. (2006) propose that 'climate change champions' (people who care about climate change and who, by virtue of their leadership qualities and position in their community/workplace, can lead change) should be identified and supported. It is also suggested that celebrities can popularize concern about climate change (Chib et al., 2009; Platt and Retallack, 2009), although Boykoff and Goodman (2009) question whether their involvement really does open up public discourse, or reduces it to the status of fashion and fad.

2.5.5 Education and learning

Finally, it is important to understand that knowledge is constructed rather than simply received (Darby, 2006a; Kearney, 1994). New information is fitted into individuals' existing mental models (Kempton, 1991; Kloeckner, 2011), thus people may learn and remember quite different information from the same educational experience or communication. As already discussed (section 2.2.7), tacit knowledge gained from experience is also important when it comes to responding to climate change-related communications (Darby, 2006a).

Discussing formal education for sustainability, Vare and Scott (2007) suggest that there has so far been too much emphasis on prescriptive education, and not enough on enabling people to think and find solutions for themselves. They argue that sustainability requires that people develop these skills, especially in the absence of universally agreed facts and needs. Heimlich and Ardoin (2008) also advocate that there is a need to teach skills for sustainability.

Bandura's (1977b) Social Learning Theory proposes that most human behaviour is learned through observing the attitudes, behaviour, and behavioural outcomes that others model (deliberately or otherwise). This theory is enacted in entertainment-education (E-E), which uses entertainment media formats such as radio soap operas, telenovelas, and television dramas to promote health and social messages (see e.g. Hether et al., 2008; Papa et al., 2000; Wilkin et al., 2007). E-E works by portraying characters that the audience relate to changing their attitudes and behaviour, often after learning new information; this models desirable actions, gives people a sense of self-efficacy, and changes outcome expectations because seeing 'good' behaviour being rewarded reinforces that behaviour as desirable (Bandura, 2004).

Moyer-Gusé (2008) explains that E-E can be more effective than overt messages as it may be less likely to be perceived as persuasive in intent, thus triggering less avoidance and reactance; engagement with both the narrative and the characters also means that the audience is less critical and not so inclined to argue with the embedded persuasive message. E-E has been used successfully to promote a variety of health-related and socially-desirable behaviours, from breast cancer

screening to action against domestic violence (Usdin et al., 2004; Wilkin et al., 2007).

2.6 Promoting lower-carbon behaviours and lifestyles

Interventions to promote lower-carbon behaviours and lifestyles can generally be categorised as either 'psychological' or 'structural' strategies (Steg, 2008). Psychological strategies aim to change behavioural antecedents such as knowledge, attitudes, and perceptions of agency; i.e. they attempt to address the subjective barriers to PEB listed in Figure 12 (p. 52), as well as the individual objective barriers, except for personal financial constraints on opportunity. Strategies that belong in this category include tailored information, social modelling, public commitments, goal setting, prompts, implementation interventions, feedback, using norms, 'nudges', financial incentives (rewards/penalties), and promoting group action. Structural approaches aim to address the collective objective barriers to action (see Figure 12) through provision of appropriate infrastructure and services. Personal financial constraints on opportunity can be mitigated through grants and special loan arrangements for energy efficiency measures; although these can be similar to the financial incentives mentioned above they are more than just a psychological motivator for action insofar as they make choices possible that would otherwise be too expensive.

2.6.1 Tailored information

In contrast to general information, 'tailored' (personalised) information about how to reduce energy consumption can be effective (Scottish Government, 2011; Steg, 2008; Wilson and Hawkins, 2011). Examples include personal travel plans and advice following a home energy assessment. Gram-Hanssen (2010) found that one-third of households in her study reduced standby electricity consumption following a visit to their home by an energy advisor, while leaflets and invitations to use an informative website made no significant difference. The UK government has launched a trial of tailored energy-saving advice provided to British Gas customers who have received smart meters, which allows analysis of current patterns of energy

use (Cabinet Office, 2011). Home Energy Performance Certificates have also been redesigned with the aim of making the tailored information they provide more attention-catching and salient, and signposting improvements that qualify for Green Deal support (which allows energy efficiency improvements to be made without up-front payment). Research has shown that Energy Performance Certificates have had a limited effect on purchasing decisions and home energy improvements so far (Cabinet Office, 2011); a study in Germany by Amecke (2012) that found the same result suggests that this is because people have difficulty understanding the financial implications of energy efficiency and that energy efficiency has only a minor influence on purchasing decisions.

2.6.2 Social modelling

Modelling of household conservation actions has been shown to be helpful (Osbaldiston and Schott, 2012; Steg, 2008). Hamilton and Killip (2009) and Wilson and Hawkins (2011) suggest that there is potential in 'demonstration eco-homes' or 'eco-homes open days', allowing people to see and hear about how others have installed home renewable energy generation systems or energy efficiency measures. A study by Cobern et al. (1995) found that neighbours of individuals who made a commitment to grass cycle (compost or leave grass clippings on their lawn) and talk to their neighbours about it were more likely to grass cycle than the neighbours of a control group.

2.6.3 Public commitments

Many authors advise that individuals should be encouraged to make public commitments to (specific) lower-carbon behaviours (e.g. Corner, undated; McKenzie-Mohr, 2008; Prendergrast et al., 2008), because people seek to be consistent with their public promises (Dolan et al., 2012). Examples include pledge campaigns, such as that run by 'Manchester is My Planet' (Heiskanen et al., 2010); encouraging people to display bumper stickers or fridge magnets (Bator and Cialdini, 2000); and getting individuals involved in a home energy assessment so that they are more likely to then take the actions advised (McKenzie-Mohr, 1994).

A review of studies promoting household energy conservation provides empirical evidence that commitments can be useful (Abrahamse et al., 2005), as does a meta-analysis of pro-environmental behaviour experiments by Osbaldiston and Schott (2012) that showed that commitments are effective in combination with goal-setting. The study of grass cycling by Cobern et al. (1995) found that participants who made a commitment to grass cycle and talk to their neighbours about it put out significantly fewer bags of grass clippings for collection than either the control group, or another group who made a commitment to grass cycle but not to talk about it, demonstrating that the commitment does need to be public.

2.6.4 Goal setting

Several studies show that setting specific goals regarding behaviour (or energy/emissions reductions) can be a successful means to promote change, especially in combination with other strategies such as feedback (Abrahamse et al., 2005, 2007; Wilson and Hawkins, 2011). Osbaldiston and Schott's (2012) meta-analysis of PEB experiments found that goal setting on its own is not one of the most effective tactics (though is seems to work well when the aim is to reduce petrol consumption), but in combination with commitment, rewards, or instructions it has some effect.

2.6.5 Prompts

Another change-promoting strategy, advocated in particular to overcome the force of habit, is the use of prompts to remind individuals about desired behaviour (McKenzie-Mohr, 2008). Prompts have been found to increase recycling (Schultz et al., 1995), and promote other PEBs (Osbaldiston and Schott, 2012); findings regarding household energy conservation are mixed, with Steg (2008) concluding that prompts can be useful but the three studies included in the meta-analysis by Osbaldiston and Schott (2012) showing no effects.

2.6.6 Implementation intentions

Corner (undated) proposes another strategy to help people overcome the force of habit: encourage them to make 'if… then' plans. These are called 'implementation intentions' (Gollwitzer, 1993; Gollwitzer and Brandstätter, 1997), and the idea is to "link an intended goal-directed behaviour to an anticipated situational context" so as to "induce direct (automatic) control of the intended behaviour" (Gollwitzer, 1993, p. 141). For example, a person might make a *commitment* to reduce their consumption of hot water by taking shorter showers, setting a *goal* to spend no more than five minutes in the shower each time. They then form an *implementation intention*, or plan of action: "as soon as I get home I will stick the shower timer I have been given in my shower cubicle, and every time I take a shower I will turn the timer and stop the water flow when the timer runs out".

There is evidence that implementation intentions effectively promote the achievement of goals in domains other than PEB (Gollwitzer, 1993; Gollwitzer and Brandstätter, 1997), but few interventions promoting lower-carbon behaviours have made use of this strategy. One study did encourage people to make an implementation intention regarding testing a bus route, and found that this increased the probability that the goal intention to use the bus translated into actually doing so, by overcoming the negative influence of habit (Bamberg, 2000).

2.6.7 Feedback

Feedback on energy use is considered an important element of encouraging change (see e.g. Darby, 2006a; Darnton et al., 2006). Reviewing studies on the impact of feedback mechanisms including metering, billing, and direct displays (e.g. energy monitors), Darby (2006b) concluded that a 5–15% reduction in energy use can be achieved using direct, immediate feedback, while indirect, delayed feedback (mostly that which can be given through billing) led to 0–10% reductions. Partly as a result of this, over 53 million 'smart meters' that will provide real time information on gas and electricity consumption will be installed in homes and small businesses in the UK between 2014 and 2019 (DECC, undated).

Stern (2011) notes that energy consumption reductions in response to feedback generally happen quickly and are therefore likely to come about due to behavioural changes rather than the adoption of more energy efficient appliances; he suggests that this means that "the greatest potential impact from feedback probably lies in the areas of energy-smart driving and home heating and cooling" (p. 308). A qualitative study by Hargreaves et al. (2010) found that giving individuals energy monitors did lead some participants to get rid of high-energy appliances, as well as promoting changes such as turning appliances off or using them differently. He et al. (2009) suggest that feedback technologies should be designed to give different kinds of feedback to individuals who have diverse motivations and are at different stages of change.

However, a review of interventions designed to encourage household energy conservation found that although feedback often works, especially when frequent, low or medium energy users may increase their energy use (Abrahamse et al., 2005). This is known as a 'boomerang effect' and occurs because people tend to match their behaviour to an average (Schultz et al., 2007).

2.6.8 Using norms

The boomerang effect was also in evidence in a study by Schultz et al. (2007), who gave householders feedback on their electricity usage compared to the mean for all the households in the study (i.e. employing a *descriptive* norm). However, the effect was eliminated in one group that was given messages employing *injunctive* norms along with the descriptive information: a smiley face if electricity use was below average, and a sad face if above average (thus conveying approval or disapproval regarding energy consumption). Two similar, larger-scale studies by Ayers et al. (2009) found that there was a slight boomerang effect even when injunctive norm messages were used, with the lowest energy users increasing consumption, but overall the intervention led to reduced energy consumption and the effects continued seven and twelve months respectively after the beginning of the two studies.

Other studies have also shown the beneficial effects of using normative messages to encourage PEB. For example, Goldstein et al. (2008) found that

normative appeals in hotel rooms stating that the majority of guests use their towels more than once are more effective at promoting towel reuse than messages that focus on the environmental benefits of reducing energy use by reusing towels. The messages were most effective when they stated that the majority of the guests "who stayed in *this* room" (emphasis added) reused their towels. It is important, however, to avoid using messages that give a descriptive norm highlighting that many people engage in undesirable behaviour, or do not perform the behaviour that the message is attempting to promote, as this will put individuals off acting for the same reasons that a positive descriptive norm encourages action (Bator and Cialdini, 2000).

The UK government has announced a trial of energy billing that will include both comparative and normative feedback, along with tailored messages regarding how energy use can be reduced (Cabinet Office, 2011).

2.6.9 'Nudges'

Using normative messages is an example of a 'nudge' strategy, a term popularised by Thaler and Sunstein (2009), who explain that the idea is to encourage people to make 'good' decisions, without curtailing their freedom to choose otherwise. Otherwise known as 'libertarian paternalism', this strategy "has been emerging as an ad hoc principle of governmental practice for several years in the UK" (Jones et al., 2011, p. 485). Jones et al. (2011) identify four different types of nudge strategy: spatial design and (choice) architecture; temporal ordering; measures to promote rational choices; and encouraging beneficial social norms. Examples of each of the first three types that could support lower-carbon behaviours include: placing energy-efficient appliances in prime display locations in shops, with the least efficient appliances in the least visible spots (spatial design); offering personalised travel planning services to new employees so that low-carbon options can be explored before commuting habits have been formed (temporal ordering); ensuring that default modes on appliances (e.g. how quickly computers switch to 'hibernate') are low-energy options (promoting rational choice). The rule for nudges is that it must be cheap and easy to avoid the choice one is being nudged towards (Thaler and Sunstein, 2009). Thus there is a question about how much can really be achieved

through libertarian paternalism; it is difficult to imagine a nudge that will lead to many people choosing not to fly on holiday, for example.

2.6.10 Rewards/penalties

Financial incentives or penalties are sometimes used to try to encourage PEB, as economic theory teaches that people respond to price signals (Dolan et al., 2012). To the extent that financial incentives aim to change attitudes towards certain products or behaviours, they can be regarded as part of the repertoire of psychological strategies; grants or loans that exist to help individuals who would otherwise not be able to afford energy efficiency measures are a somewhat different matter.

There is some evidence that incentives may work (Hines et al., 1986/7); however, caution is needed when attempting to use this strategy (Scottish Government, 2011). Financial incentives do not necessarily motivate action, and especially if they are perceived as being small, they may actually decrease the incidence of desired behaviour (Gneezy and Rustichini, 2000a). Gowdy (2008) explains that altruistic motives for action may be 'crowded out' when monetary rewards are offered, leading, for example, to lower blood donation rates when payment is offered than otherwise. Gneezy and Rustichini (2000b) found that penalty fines led to an increase in undesirable behaviour; they propose that individuals may consider a fine as simply a price to pay for the right to behave in a certain way. This suggests that a carbon tax or similar might not lead to emissions reductions among people who can afford to pay increased prices, instead potentially resulting in individuals becoming less likely to try to reduce their carbon footprint because they believe that they have paid for the damage associated with their emissions so that it is not a problem. This is also one of the arguments put forward against 'carbon offsetting' schemes (e.g. see the 'cheat neutral' website, www.cheatneutral.com).

Using financial incentives to promote PEB is additionally criticised because *intrinsic* motivations (such as satisfaction or ethical concerns) promote more committed and persistent engagement than when behaviour is undertaken in response to *extrinsic* motivations such as financial rewards (Crompton, 2008). Two reviews of empirical studies on household energy conservation found that rewards often work

only in the short-term or for as long as the incentive lasts (Abrahamse et al., 2005; Wilson and Hawkins, 2011).

Finally, the 'principal agent problem' may limit the efficacy of incentives or penalties in some cases, where decision-makers are insulated from price signals: for example, drivers of company cars (Graus and Worrell, 2008). Another example would be the landlord-tenant problem: a landlord has no incentive to make energy efficiency improvements to a property if the financial benefits only accrue to the tenants in the form of reduced bills.

2.6.11 Promoting group action and participatory problem solving

Many of these strategies target individuals, but there are problems doing so because individuals make decisions in households (Hargreaves et al., 2010), lack a sense of agency working alone (Blake, 1999; Heiskanen et al., 2010), and face very high levels of complexity about choices (Moisander, 2007). As already discussed in section 2.3.3, group action provides many benefits, and the UK government has recognised the advantages of engaging people at the level of groups and communities (Defra, 2005). Christie et al. (2010) suggest that, due to low levels of trust in government messages and authority, there is probably need for a greater role for civil society groups such as NGOs and faith communities in promoting climate change-related debate and action.

Participatory problem solving is also recommended (e.g. by Farrell and Shalizi, 2011; Kaplan, 2000; Owens, 2000), although participatory workshops aimed at envisaging climate change adaptation and mitigation scenarios resulted in suggestions that were less radical than researchers suggest are necessary, and highlighted tensions between content values (e.g. achieving reduced climate impacts) and process-oriented values such as building trust, learning, and mutual understanding (Larsen and Gunnarsson-Östling, 2008). Cohen (2012) suggests that local councils could engage the public in participatory emissions budgeting, arguing that "It may help citizens to appreciate the nature of the challenge and the role of local government in responding; this may in turn provide authority stakeholders with increased confidence in the scope to implement pro-environmental agendas without meeting significant resistance" (p. 18).

2.6.12 Structural strategies and grants or loans for energy efficiency measures

Grants and loans can make energy efficiency measures more affordable (as well as psychologically more attractive). The new Green Deal in the UK allows customers to have energy efficiency technologies installed in their homes without paying up-front costs, so long as the savings are expected to be greater than the costs over the lifetime of each measure. Costs are recovered via payments added to energy bills. The uptake of such incentives depends on factors such as how well they are marketed, how easy it is to access information on how to take advantage of the deal, and the cognitive burdens it imposes, like the need to find a suitable supplier/installer (Stern, 2011).

As well as financial opportunities, it is obvious that, in order for people to be able to make certain lower-carbon choices, particular types of services, regulations, or infrastructure need to be in place: it must be possible to catch a bus, have a solar thermal system installed (which listed building regulations can make difficult), rent an allotment, and so on. When infrastructure is in place that makes a pro-environmental behaviour easy – as with kerbside recycling – take-up rates are high (Guagnano et al., 1995). However, simply focussing on improving structures and services will not be enough to ensure that people adopt lower-carbon behaviours, because of the psychological factors that inhibit change (Gifford, 2011), and because "it turns out to be very difficult to realize the environmental benefits of eco-designed products, technologies and infrastructures when they are designed without reference to the user-practices they help constitute and are implemented without the knowledge and education of practitioners" (Spaargaren, 2011, p. 815).

2.6.13 General conclusions regarding policies to promote lower-carbon lifestyles

Policies that address both the psychological and structural, internal and external factors that influence behaviour are necessary (Prendergrast et al., 2008; Southerton et al., 2011; Stern, 2011), and should address business behaviours and whole system change at the same time as individual/household level behaviours, so as to promote normative social change (Lucas et al., 2008). A 'whole house' or 'whole lifestyle' approach is also advocated, rather than targeting particular

behaviours, so as to lessen the risk of rebound effects and encourage necessary changes across different domains of action (Barr, Shaw, et al., 2011; Wilson and Hawkins, 2011). MacKay (2009) makes the case that we need to target really significant changes, arguing that "*If everyone does a little, we'll achieve only a little*" (p. 114; emphasis in original). Levin et al. (2012) suggest that it is necessary to develop policies that will "constrain our future collective selves" (p. 123) through progressive incremental forces that will promote durable changes among an expanding number of people by triggering 'path-dependent processes' – processes whereby people become 'locked-in' to certain types of behaviour, or to choosing certain products, because of previous choices. So far, path-dependency and lock-in has often had negative effects; for example, when little provision is made for cyclists so people choose to drive who might otherwise cycle, leading to higher traffic volumes and an even less attractive environment for cycling.

The current emphasis on market solutions is criticised by Randalls (2011) for not opening up the broader ethical and political debates that he argues are necessary for a thorough engagement with the issue. Current policies are also criticised, as discussed in section 2.2.10, for focussing too much on individuals and the concept of personal choice (e.g. Shove, 2010). Contemporary forms of carbon governance involve encouraging people to take responsibility for governing their own behaviour (Paterson and Stripple, 2010; Rutland and Aylett, 2008); Shove (2010) argues that this allows governments to avoid their responsibilities.

Fischer et al. (2011) found that many of their interviewees believe that people generally are so self-centred, consumption-oriented, and influenced by habit and monetary concerns that 'drastic' price changes and strict regulations will be necessary (alongside new technologies) to achieve behavioural changes. However, at present it seems likely that such policies would be very unpopular; for example, a sample of tourists considered policies to limit air travel unacceptable (Becken, 2007). Studies show that energy policies are more acceptable if they increase rather than restrict choice, target energy efficiency rather than curtailment, and aim to reduce energy used in the home rather than for travel (Steg, 2008). Vehicle and building standards are strongly preferred over taxes on petrol or electricity (Leiserowitz, 2007a). Policies receive less (theoretical) support if they are perceived as likely to

fail to solve the problem (Akter and Bennett, 2011; Schuitema et al., 2010); having said that, effective policies may have perceived negative impacts, so individuals could be protecting themselves from cognitive dissonance by making a judgement that certain policies will not work. Gowdy (2008) argues that as cooperation depends on punishment of 'free-riders' (those who benefit from action without engaging in it themselves), climate change policies must be perceived to be fair; this seems to be borne out by the finding that support for policies increases when it is suggested that all the countries with highest emissions will implement similar regulations (Akter and Bennett, 2011). It may be that the influence of people working in groups will not be so much in terms of significant CO_2 reductions, but in encouraging others, including governments, to act (Letcher et al., 2007).

The UK government has developed a behaviour change model that sets out the need for policies to enable, engage, and encourage people to act, and for government to exemplify lower-carbon behaviours (Defra, 2005). It has identified twelve PEB goals to focus on, many of them lower-carbon behaviours such as installing insulation and eating food locally in season (Defra, 2008a). The 'UK Low Carbon Transition Plan' identifies "Supporting individuals, communities and businesses to play their part" as one element of a five point plan to address climate change (HM Government, 2009).

2.6.14 Problems with evaluations of interventions to promote PEB

There is relatively little literature evaluating government policies or community-based projects promoting PEB or lower-carbon lifestyles, and very little indeed that quantifies carbon reductions. The studies that exist are often flawed by small sample sizes; sampling biases (e.g. highly motivated, higher income, and more educated people than the general public); a lack of control groups or baseline measurements for the purposes of comparison; confounding effects, which make it difficult to isolate the effects of one intervention; a lack of longitudinal data; failure to examine the determinants of energy use/savings, so that it is difficult to know *why* effects occur; reliance on stated intentions or self-reported, rather than observed, behaviour; and failure to check whether behavioural changes actually result in energy savings – they may not, because of the rebound effect (Abrahamse et al., 2005;

Wilson and Hawkins, 2011). Furthermore, even if there is no rebound effect, individuals who report more PEB do not necessarily use less energy than others (Gatersleben et al., 2002); it is a mistake to assume (as, for example, Barr et al., 2005) that reported energy conservation practices correlate linearly with energy used – an individual who reports not turning their heating down might be living in a smaller house heated less often than an 'energy saver' who has turned the thermostat down in a large house still heated to 20°C.

Studies that evaluate the effectiveness of promoting behaviours such as recycling cannot be used to infer whether campaigns to encourage higher-cost behaviours (such as cycling rather than driving) will work, since these are less acceptable (Barr et al., 2010; Fortner et al., 2000; Whitmarsh, 2009a) and individuals face different barriers to adopting these behaviours.

Finally, as stressed by Middlemiss (2008, pp. 79-80):

> the question to be considered in evaluating a particular intervention is 'what works, for whom, under which circumstances?' rather than the more common (and simplistic) 'what works?'

2.7 Implications of this review for the thesis

The following is a brief summary of the main points to take from this review, answering the questions posed in Chapter 1 (section 1.3).

What do the public need to know and understand about climate change to motivate and undertake deliberate mitigation action?

A detailed understanding of climate change is not necessary to undertake deliberate mitigation action, but it is likely that comprehension of the major role of anthropogenic activities *is* necessary to motivate action, along with an understanding of the link to everyday practices and behaviours. Knowledge of the relative impact of different activities would be useful to inform the choice of mitigation actions.

What do they already know, and where are the gaps in knowledge and understanding?

There are high levels of awareness of climate change in the UK, and many individuals have a basic understanding of some of the causes and actual/potential impacts. The most important gaps in knowledge and understanding are arguably the potential for temporally and spatially near impacts; the relative emissions associated

with different behaviours; and effective mitigation actions that individuals and households can take.

What factors other than knowledge and understanding influence attitudes and behaviour relevant to climate change mitigation?

Information is filtered through personal beliefs, worldviews, and attitudes to risk and governance, and many factors other than knowledge and understanding influence attitudes and behaviour. These include, for example, social norms, sense of agency (self-efficacy and locus of control), ascriptions of responsibility, personal (moral) norms, values, situational conditions, habits, personal abilities, affect and emotions, self-concept/identity, and roles (see Table 3, p. 51). The number and variety of such factors, and the sociological critique of the focus on 'behaviour' and 'behavioural antecedents' (see section 2.2.10) reveals how complex this area of study is. Many models have been developed to try and explain behaviour (see section 2.2 for some of them), but although these can be useful for exploring theories, in general only the most comprehensive models explain a high proportion of the variance in behaviours, and such models are difficult to use due to the amount of information they require researchers to collect and process.

What kinds of communications and other interventions have so far been employed to encourage climate change mitigation action, and how effective have they been?

Climate change communications have often focussed on providing problem information and 'small steps' solution messages, which have not been very effective at promoting change. Communications also use fear appeals and it is not clear whether this is a good tactic. Interventions involving strategies such as using norms, encouraging people to make public commitments and implementation intentions, and giving feedback have all been successful to some degree, but these have generally been small-scale projects, and there is not enough information on whether effects last.

What are the barriers – practical, psychological, and social – to individuals taking action and making emissions-reducing behavioural changes?

The barriers to climate change mitigation action are many, and relatively well understood. They include individual subjective factors such as ascription of

responsibility to others; collective subjective barriers like unhelpful social norms; individual objective problems such as a lack of necessary skills to take action; and collective objective barriers including lack of appropriate infrastructure and services necessary for the performance of lower-carbon behaviours (for a more comprehensive list, see Figure 12, p. 52).

What motivates people who have already adopted lower-carbon lifestyles, and what can we learn from their experiences of behavioural change?

Although studies have demonstrated correlations between behavioural antecedents (such as values) and PEB, little research has been done to understand in depth the motivations of those who have already adopted lower-carbon lifestyles. More attention has been paid to quantitative surveys seeking to develop or test models of the factors that influence behaviour, than to the process of pro-environmental behavioural change.

Are there insights and models relating to behavioural change from fields other than pro-environmental behaviour that might usefully be employed in promoting lower-carbon lifestyles?

There are various theories and models available, some of which have been mentioned (e.g. spillover and foot-in-the-door theory, section 2.3.1). One model that seems to have particular potential is the transtheoretical model of behavioural change from the field of health psychology (section 2.3.2).

Is there potential for policies and interventions that promote lower-carbon lifestyles without relying on individuals to take action specifically to mitigate climate change?

There is currently debate and concern about using rewards and appeals to financial considerations to promote lower-carbon behaviours, with proponents arguing that these mechanisms engage individuals who otherwise would not change their behaviour, whereas opponents fear that such strategies entrench values inimical to sustainability, may lead to rebound effects, and will make it harder to promote behaviours that are more costly (in terms of time and effort as well as money). However, there is also an important argument coming from sociologists about the need to recognise that individuals are often 'locked-in' to certain ways of behaving, and to make practices rather than individuals the focus of attention; changes in

infrastructure, for example, may lead to lower-carbon behaviours and lifestyles being adopted without deliberate intentions to mitigate climate change.

Arguably, one could also conclude from this review that current levels of voluntary climate change mitigation action, lack of willingness to act if others are perceived not to, and the structural barriers to lower-carbon behaviours that exist indicate that more radical legislation will be necessary to ensure that individuals change their behaviour even if they are not motivated to mitigate climate change.

Chapter 3: Methodology and methods

As shown at the end of Chapter 2, a review of the literature relevant to promoting lower-carbon lifestyles suggests several possible lines of further enquiry. Consideration of these led to the development of the research aims detailed in section 1.3.

The thesis is not driven by a single theory or methodological approach; as explained in Chapter 1, interdisciplinary research is appropriate in this field, and the work was also designed so that later stages could build on or complement what had gone before, and take account of new insights discovered along the way. Production of a thesis by papers rather than the more traditional style enabled the research to take the form of several linked projects.

In outline, the work begins by considering whether a specific intervention – a climate change film – achieves its makers' aim of encouraging mitigation action, and then considers more generally the potential for films to play a part in promoting lower-carbon lifestyles. The issue is then viewed from another angle, involving research with people who have already adopted such lifestyles, in order to discover what can be learned from their experiences and opinions. Detailed information about methods and participants involved in each study is included in the relevant papers (see Chapters 4–8); the purpose of this chapter is to give a brief overview of the methodology for the thesis as a whole.

3.1 Rationale for the thesis aims

In recent years climate change has begun to feature in documentary films (e.g. Al Gore's *An Inconvenient Truth*, 2006) and even Hollywood blockbusters (*The Day After Tomorrow*, 2004). As section 2.5.1 makes clear, media representations of climate change can be very influential, and film is an appropriate vehicle for the stories and vivid images that are recommended as means to encourage emotional engagement with the issue (Futerra, 2005; Kearney, 1994). Entertainment-education has been successfully employed to increase awareness and knowledge about health issues, and to change attitudes and even behaviour regarding these issues (Hether et

al., 2008; Vaughan et al., 2000; Wilkin et al., 2007). However, papers on the impact of the 'disaster movie' *The Day After Tomorrow*, drew mixed conclusions (Lowe, 2006). Furthermore, studies that investigate the effects of communications such as films on attitudes and behavioural intentions often do not attempt to assess their impacts on behaviour (e.g. Balmford et al., 2004; Beattie, 2011). Thus it seemed that a good starting point for the thesis was to assess the impacts of a climate change film on viewers' attitudes *and* behaviour. The release in 2009 of the British film *The Age of Stupid* (which garnered attention in much of the UK media; see, e.g. Carus, 2009; Jackson, 2009; Maher, 2009; Mansfield, 2009) provided an opportune and interesting case study (Paper 1, Chapter 4).

This is an innovative movie, both in being 'crowd funded' by ordinary individuals and groups such as a hockey team, and because it combines fiction and fact through documentary, drama, and animation. However, it adopts a 'doom and gloom' presentation of the issues, apparently appealing to fear in an attempt to encourage viewers to take action in response. The literature on the efficacy of fear appeals is inconclusive (Meijnders et al., 2001b; O'Neill and Nicholson-Cole, 2009), suggesting that research on the impacts of *The Age of Stupid* might be a useful addition. Thus a three-stage panel study of audience members who saw the movie at the Edinburgh Filmhouse during its opening week was developed (see section 3.2, below, for details of methods and materials).

The study was then extended by the addition of a fourth questionnaire a year after the third one (15 months after participants viewed the film), because there is a need for longitudinal studies of the impact of climate change communications and interventions promoting pro-environmental behaviour (Moser, 2010; Steg and Vlek, 2009). Although it was clear that changes in concern and *attitudes* prompted by the film had already generally faded by the time of the third questionnaire, continuing the investigation offered the opportunity to discover whether the *behavioural* changes reported persisted, and also whether behavioural intentions expressed on questionnaire three translated into action (Paper 2, Chapter 5).

Having completed the study investigating the impacts of *The Age of Stupid*, I judged that a useful addition to broaden the work would be a more general consideration of how films can be used as a means of promoting lower-carbon

lifestyles (Paper 3, Chapter 6). Since change is a process over time, rather than a single event, analysis employing a process model of behavioural change was deemed appropriate. I chose the transtheoretical model developed by health psychologists (Prochaska and DiClemente, 1982; Prochaska and Velicer, 1997) because it has been very influential in the field of health behaviour change and has been successfully used to evaluate the effectiveness of the film *Super Size Me* as a tool to promote attitudinal and behaviour change relating to fast-food consumption (Cottone and Byrd-Bredbenner, 2007). The model proposes that interventions (including communications) designed to encourage or help individuals to change their behaviour should involve processes of change appropriate to the stage of change reached by the target audience/group. The model appeared to have potential as a tool to analyse the change processes employed by films aimed at promoting lower-carbon lifestyles, and to aid the design of appropriate communications and interventions for audiences and publics that differ with regard to levels of climate change concern and current mitigation action. Thus this second project aimed both to identify the strengths and limitations of films as means to promote climate change mitigation action, and to demonstrate the possible utility of the model in the field of pro-environmental behaviour change.

Although there is further potential to apply the transtheoretical model to the study of mechanisms for promoting lower-carbon behaviours, it seemed likely that the thesis would benefit by approaching the issue from 'the other side', so to speak. Having investigated the question "Does this intervention (a particular film) achieve its purpose of altering attitudes and behaviour in favour of mitigating climate change?", and broadened it to consider "How might climate change films more generally encourage mitigation action?", I therefore interviewed people who *have* taken action, to discover what has influenced them, and whether their stories of change might provide insights into the factors that encourage or hinder lower-carbon lifestyles. Specifically, the aim was to understand more about the motivations for, and pathways to engagement in, lower-carbon behaviours and lifestyles (Paper 4, Chapter 7).

This was a promising line of research because much of the work so far in this area has been quantitative, and there is a need for more qualitative investigations

(Anable et al., 2006; Chawla, 1998b). Qualitative research allows for more depth and detail in the data-gathering process, and the part-narrative style of interviewing adopted allows participants to explain and emphasise what they identify as important influences on their behaviour, rather than the enquiry being structured and possibly limited by pre-conceived frameworks (Hards, 2012). In keeping with the holistic and dynamic approach of this work, this form of enquiry also allows for consideration of many different energy-related practices/behaviours and encourages temporally-based narratives of how and why change occurs.

The survey participants and interviewees involved in this research were atypical of the general public in terms of their high level of concern about climate change, acceptance of personal responsibility for mitigating the problem, and commitment to action. The large proportion of greenhouse gas emissions that are attributable to individuals/households (Druckman and Jackson, 2009a), the very modest reductions that can be achieved through 'soft' policy measures such as feedback (Darby, 2006b) and uncontroversial transport-related interventions (e.g. personalised travel planning, car clubs, and home-working; Cairns et al., 2004), the problem of energy efficiency gains being diminished by the rebound effect (Sorrell, 2009), and the lack of action on the part even of many people who are concerned about climate change (Downing and Ballantyne, 2007) suggest that much more needs to be done to reduce individual/household fossil fuel energy demand. At present, behaviour change seems unlikely to happen voluntarily on the scale required, even using the insights that can be gained from research into communicating about climate change, tapping into the values people hold to engage them with the issue, and other strategies discussed in section 2.6. Instead, 'hard' policies that actively constrain individuals' behaviour and related emissions in certain ways may be necessary.

The rationale for the final study reported in this thesis (Paper 5, Chapter 8) was therefore to contribute to the literature on one such proposed policy: personal carbon allowances (or personal carbon trading as it is generally called in policy circles, and therefore now in the literature). Mandatory tradable carbon allowances for individuals are designed to change behaviour through market forces (by requiring payment for any emissions above the free allocation level), and by making 'carbon' (actually carbon dioxide emissions, but the term has been simplified in public

discourses) very visible to individuals. Carbon Rationing Action Groups (CRAGs) operate a voluntary system of carbon allowances that is similar in some ways to the proposed policy, and a qualitative study was therefore designed to explore the experiences and opinions of CRAG members attempting to live within a carbon allowance, and assess the implications for potential policies, especially personal carbon trading.

3.2 Methods and materials

As stated earlier, fuller details of study methods and materials are contained within the papers in Chapters 4–8. The purpose of this section is to signpost readers to copies of research materials that are not included in those papers but are appended to this thesis, and to outline one element of the research that is not covered in the papers.

The project investigating the impacts of *The Age of Stupid* utilised four self-completion questionnaires. The first two were paper-based and administered at the Edinburgh Filmhouse before (Q1, Appendix 1) and after (Q2, Appendix 2) screenings of the film. The two follow-up questionnaires, Q3 (Appendix 3) and Q4 (Appendix 4) were administered to most participants by means of a link to an online survey contained in an email sent to each respondent, though identically-worded paper questionnaires as reproduced in the Appendices were mailed to those who gave only a postal address. Statistical analysis of the data was carried out using Statistical Package for the Social Sciences (SPSS).

Building on my earlier work, and using the knowledge gained from examining other studies of the impacts of climate change films, the second project involved a desk-based analytical exercise, applying the transtheoretical model to assess the processes employed and depicted by four very different climate change films. The films and the analysis are described in Chapter 6 and thus are not detailed here.

The third project involved interviewing individuals who have adopted lower-carbon lifestyles, recruited via emails to members of CRAGs, Carbon Conversations groups, and respondents to the earlier study on *The Age of Stupid*. Those who replied were requested to answer socio-demographic questions in order that I could choose a varied sample. The participant information sheet containing details of how data

would be stored and used, and the interviewee consent form, are reproduced in Appendix 5 and Appendix 6 respectively.

Before each interview, participants were asked to draw a 'car use life graph' showing how their use (as passenger or driver) of private cars, and the practicalities, feelings, opinions, and values relating to this, had changed over the course of their life. This exercise was designed as a means of investigating both the structural and the social-psychological factors that influence a common GHG-producing practice. This aspect of the study is not reported in the related paper (Chapter 7) for reasons of space, but the instructions regarding how to produce such a life graph, and the illustrative example I sent with these, are reproduced in Appendix 7 for the sake of completeness, and to demonstrate how the study attempted to adopt a methodology that would take account of insights from sociology, psychology, and time-geography about why practices are adopted, changed, and discarded. (The intention is to use the data gained from this exercise in a future paper.)

The interview guide for this project can be found in Appendix 8. Digital recordings of the interviews were transcribed in full by a professional service; I then carefully checked the transcriptions before coding them using NVivo software. In the process of analysing the transcripts, I developed hypotheses about the relative importance that interviewees would ascribe to different types of values, and tested these using a values survey instrument developed by de Groot and Steg (2007, 2008) (see Appendix 9). Interviewees were emailed a link to an online version of the questionnaire, and the resulting data were statistically analysed using SPSS.

The final project consisted of interviews with members of CRAGs, who were recruited via email contacts gleaned from the CRAG website. The email invitations stated that "this research on CRAGs will be feeding into a big project on demand reduction and lower carbon futures [at the Oxford University Environmental Change Institute] … We want to learn more about the motivations and experiences of people who are involved in CRAGs". Participants were asked to complete and return a brief questionnaire before being interviewed, in order to collect basic data about the CRAG they belonged to (see Appendix 10); this was sent and returned by email. Appendix 11 contains the interview guide used for this project.

3.3 A brief outline of the papers

Paper 1 (Chapter 4) reports the results of the first three stages of the quantitative assessment of the impacts of the climate change film *The Age of Stupid* on viewers' attitudes and behaviour. The results of the follow-up survey administered to participants a year later are then presented in Paper 2 (Chapter 5), which also extends the work by providing a critique and discussion of the methodological challenges involved in researching the long-term behavioural impacts of climate change communications.

Paper 3 (Chapter 6) explains the transtheoretical model of behavioural change and offers an analysis of the processes employed and depicted by four very different climate change films, in order to consider *how* such films might encourage individuals to adopt lower-carbon practices and lifestyles. This work is reported with the aim of bringing the model to the attention of more environmental social scientists and climate change communication practitioners, and offering pointers as to how it could be used.

Paper 4 (Chapter 7) discusses the values, motivations, and routes to engagement with climate change mitigation action that emerged from the narratives of interviewees who have adopted lower-carbon lifestyles. This focus was chosen for the first paper based on the interview data because the findings regarding these themes were striking and, at times, contrary to popular assumptions and previous studies.

The final publication in this thesis, Paper 5 (Chapter 8), presents the results of research into the operation of a voluntary version of carbon allowances, and discusses the implications of the findings for demand management policies, especially – but not solely – personal carbon trading.

Part Two: The Papers

Chapter 4: Lights, camera… action? Altered attitudes and behaviour in response to the climate change film *The Age of Stupid* [Paper 1]

This chapter has been published as: Howell, R.A., 2011. Lights, camera ... action? Altered attitudes and behaviour in response to the climate change film *The Age of Stupid*. Global Environmental Change 21, 177–187.

Abstract

The film *The Age of Stupid* depicts the world in 2055 devastated by climate change, combining this with documentary footage which illustrates many facets of the problems of climate change and fossil-fuel dependency. This study investigates the effects of the film on UK viewers' attitudes and behaviour through a three-stage survey. Analysis of changes in attitudes focussed particularly on respondents' *concern* about climate change, *motivation* to act, *fear* about the potential for catastrophe, beliefs about *responsibility* for action, and sense of *agency*. The film increased concern about climate change, motivation to act, and viewers' sense of agency, although these effects had not persisted 10–14 weeks after seeing it. It was also successful in promoting some mitigation actions and behavioural change, although respondents reported barriers to further action, such as limited options for improving home energy efficiency among those in rented accommodation. However, filmgoers were atypical of the general public in that they exhibited very high levels of concern about climate change, knowledge about how to reduce their carbon emissions, and contact with organisations campaigning about climate change, before they saw the film. The paper considers how these factors may have enabled viewers to respond to the film as they did, as well as policy implications for those seeking to develop effective climate change communications.

Keywords

Pro-environmental behaviour; Behavioural change; Climate change communications; Public attitudes; Agency; Motivation

4.1 Introduction

Individuals are responsible, through their use of household energy and personal travel, for approximately 35% of total UK greenhouse gas (GHG) emissions, and indirectly, through household final consumption expenditure, for a further 51% (ONS, 2004). Clearly, significant reductions must be made in individuals' emissions in order to meet UK targets of 80% reductions from 1990 levels by 2050. Faced with the failure of traditional information campaigns about environmental issues to promote behavioural changes among the UK public (Collins, 2004; Hinchcliffe, 1996), concerned individuals and organisations have been seeking alternative ways to raise concern about climate change and promote lower-carbon lifestyles. *The Age of Stupid* is a film made with the stated intention "to turn 250 million viewers into climate activists" (AoS, undated). It presents a dystopian vision of the future, along with documentary strands which outline many of the facets of the problem of our dependency on fossil fuels. This paper assesses the success of the film in motivating viewers to raise awareness and lobby politicians about climate change, and to make behavioural changes to reduce their GHG emissions, and seeks to draw conclusions about the use of vivid and emotionally-engaging messages in climate change communications.

4.1.1 Climate change communications: information, affect and agency

Although knowledge about both the causes of climate change and means of reducing emissions is an important factor influencing pro-environmental intentions and behaviour (Bord et al., 2000; Gram-Hanssen, 2010; O'Connor et al., 2002), the 'information deficit' model of behaviour change, whereby it is assumed that the public simply need more information in order to take action, has been widely criticised as insufficient (e.g. Anable et al., 2006; Blake, 1999; Bulkeley, 2000; Owens, 2000). There is a well-documented gap between environmental attitudes

(which are more amenable to change through information provision), and pro-environmental behaviour (Gatersleben et al., 2002; Kollmuss and Agyeman, 2002). In an attempt to effectively engage the public, visual and emotionally-based appeals are frequently employed within the environmental movement (Huddy and Gunnthorsdottir, 2000). Nicholson-Cole (2005, p. 258) suggests that visual media offer many advantages for communicating motivating messages, including "the capacity to convey strong messages, making them easy to remember; condense complex information and communicate new content; provide the basis for personal thoughts and conversations, contributing to people's memory and issue-awareness; [and] communicate ideas in an instant". Research by Pooley and O'Connor (2000) suggests that affect – feelings about specific objects, ideas, and images – plays an important part in determining people's attitudes and responses to environmental issues (see also Gatersleben and Appleton, 2007, and Steg, 2005, who suggest that affective motives are important determinants of car use), and therefore that emotions, not just knowledge, need to be targeted by environmental education campaigns.

However, not all emotions are helpful in this context. Campaigns which appeal to fear as a motivator are problematic because fear can trigger denial, apathy, repression, anger and counterproductive defensive behaviours (such as buying a 'high-carbon' sports utility vehicle to protect oneself against an unpredictable environment) in response (Moser and Dilling, 2004). There is a need for a positive vision to sustain people taking climate change mitigation action because results will not be seen quickly (Moser, 2006).

Related to this is the fact that a sense of agency is one of the most important factors in determining whether people engage in pro-environmental behaviour (Gilg et al., 2005; Kaplan, 2000; Kollmuss and Agyeman, 2002). People need to believe that they *can* do something about the problem, and that it is *worth* doing something.

The Age of Stupid is one of several attempts to harness the advantages of visual communications to raise concern about climate change through film. Others include *The Day After Tomorrow* (2004), a scientifically inaccurate Hollywood disaster movie depicting sudden and catastrophic climate change, Al Gore's documentary *An Inconvenient Truth* (2006) and the documentary *Home* (2009).

A number of studies investigated the impact of *The Day After Tomorrow* on viewers, including one in the USA (Leiserowitz, 2004), two in the UK (Balmford et al., 2004; Lowe et al., 2006), one in Germany (Reusswig et al., 2004) and a Japanese study which is reported in Lowe (2006). The UK and US studies found increased levels of concern about climate change among viewers of the film (this was not investigated in the other studies), while the US, Japanese, and one UK study found that there was increased motivation to individual action among viewers, and the other studies found no change (see Lowe, 2006 for a summary of results of the five studies). Although some of the studies included a follow-up a few weeks after the initial research in order to determine whether observed effects had lasted, or to explore issues more deeply through focus groups, none of them investigated whether participants were actually taking any action that could be attributed to the effects of watching the film. There do not appear to be any studies which investigated the impact of other climate change films.

The Age of Stupid is interesting in that it combines elements found in these different types of films, weaving together fictional and documentary strands, and utilising dramatic and emotionally-charged images, factual human-interest stories, and cartoon animations in its attempt to engage viewers.

4.1.2 The Age of Stupid

The Age of Stupid is a 92-minute film featuring well-known actor Pete Postlethwaite as an old man living in 2055 in a world that has been devastated by climate change. The beginning of the film shows Sydney Opera House in flames, London underwater, and millions of refugees in a primitive camp. Postlethwaite's character is watching 'archive' footage from 2008 and asking, "Why didn't we save ourselves when we had the chance?"

This narrative theme provides the framework for six interweaving documentary strands which highlight different aspects of the climate change problem. One is about a wind farm developer in England whose latest proposal is being opposed by local people; a second documents the start-up of an Indian budget airline. There are also stories about those who are facing the impacts of climate change and fossil fuel dependency, including a young woman living in poverty in the Niger Delta (an area

heavily polluted by Shell), an 82-year-old French mountain guide who has seen his beloved Alpine glaciers retreat by over 150 metres in his lifetime, and a Shell employee who lost his home in Hurricane Katrina.

A third element of the film is a series of short, animated sequences explaining various points, such as the resources that go into producing bottled water.

The Age of Stupid went on general release in the UK on 20 March 2009 and received positive reviews in the mainstream press. On 23 March, the Age of Stupid website listed 78 cinemas showing the film during the opening week. These were mostly 'arthouse' venues, but included some mainstream cinemas, and the film ran for five weeks at the Odeon West End, London. The 'global premiere' of *The Age of Stupid* took place on September 21/22, when it was beamed by satellite to 63 countries around the world (AoS, undated).

The filmmakers have retained control of distribution so that individuals and organisations can hold their own screenings. This enables more widespread showing of the film than would otherwise be the case; as of 13 July 2010, 1452 screenings of the film have been arranged by independent organisers including non-governmental organisations, the National Health Service, and individuals screening to neighbours at home (AoS, undated).

There are a number of reasons to explore whether *The Age of Stupid* is successful at promoting pro-environmental behaviour. Firstly, although the film makes an emotional appeal, it is essentially another information tool. Secondly, a dominant discourse utilised by the film is the disaster narrative, not only the fictional element but, for example, through use of footage of the devastation wrought by Hurricane Katrina. Arguably, it appeals to fear as a motivator. Thirdly, although 'Not Stupid' action packs containing a brief list of suggestions under the heading 'What can I do?' were given out at many early screenings, the film itself does not directly give information about how viewers can respond to the issues raised. It does mention some possible policy options, such as carbon rationing, and it shows a few mitigation actions such as a couple calculating their carbon footprint and one character growing vegetables, but neither the film nor the action pack provide any information about how to go about lobbying politicians. (In part to address the lack of solutions-based messages, a separate campaign, 10:10, was launched on 1 September 2009 by Franny

Armstrong, the director of the film, aiming to encourage individuals and organisations to reduce their carbon footprint by 10% in 2010.[1]) These factors raise the question of whether the film promotes or decreases viewers' sense of agency to act. Thus it provides a case study to explore whether climate change communications utilising vivid images and stories, as advised in much of the literature (e.g. Futerra, 2005; Kearney, 1994; Trumbo and Shanahan, 2000), might be effective, or whether 'disaster narrative' framing of the information militates against this.

Additionally, *The Age of Stupid* garnered a lot of media attention ahead of its release, and seemed to have the potential to be influential. It has been mentioned in the UK Parliament, and Franny Armstrong spoke at several events alongside Ed Miliband, then Secretary of State for Energy and Climate Change (AoS, undated). It was therefore considered interesting to study the impacts of the film on viewers, and to take the study further than those on *The Day After Tomorrow* by exploring effects on behaviour, as well as on levels of concern and motivation to act. The study was also designed to investigate whether the film affected viewers' levels of fear and sense of agency.

4.2 Methodology

To discover the effects of the film on viewers' attitudes, the study utilised a 'pre/post-test' approach, as in similar research (Lowe et al., 2006; O'Neill and Hulme, 2009; Reusswig et al., 2004). The pre-test was a questionnaire to elicit respondents' views before seeing the film, thus providing a baseline for comparisons with two 'post-test' questionnaires, one completed immediately after seeing the film, the other a follow-up at 10–14 weeks. This period was chosen as being long enough to determine whether the observed effects lasted for some weeks, and whether the film inspired viewers to start taking action, while being short enough that respondents would not forget minor actions they had taken soon after seeing the film.

The first stage of data collection involved attending 21 screenings at the Edinburgh Filmhouse at different times of day from 20 to 24 March 2009, in order to sample a wide range of viewers. Cinemagoers were randomly approached in the

[1] See the 10:10 campaign website, available at: http://www.1010uk.org/.

foyer and asked to complete two questionnaires, one before seeing the film, the other immediately afterwards. They were offered a £5 Filmhouse voucher as an incentive, to be collected when the second questionnaire was handed in. In order to avoid encouraging 'socially desirable' responses, respondents were given a minimum of information about the study, and researchers were identified as from the University of Edinburgh but not as members of the Centre for the study of Environmental Change and Sustainability.

Participants were given a clipboard with the two questionnaires, which were attached in such a way that the second one was face down, with a reminder on the back that it should not be turned over and filled in until after the film. They were asked to hand in the first questionnaire before seeing the film, but to take the clipboard with the other one into the screening. Only three respondents out of a total sample of 244 who completed the first questionnaire failed to return the second one, and these three questionnaires were excluded from the analysis. Each questionnaire was uniquely numbered so that the 'before' and 'after' parts could be matched up. I tried to ensure that only one person from each household took part, so as not to skew results from the later follow-up questionnaire about actions taken, though individuals living in the same building but not part of one household (e.g. students in university accommodation) were allowed to participate.

The first questionnaire consisted of three multiple-choice questions plus socio-demographic information. The second questionnaire contained four multiple-choice questions, two of which were the same as those on the first one, plus two open questions. Research by Whitmarsh (2009b) has shown that the terms 'climate change' and 'global warming' are understood differently and evoke different levels of concern among the UK public. In order to avoid this affecting the data, the term 'climate change/global warming' was used throughout the survey when asking questions about climate change. In the film, 'global warming' and 'climate change' are used interchangeably. Questions regarding concern about climate change were put in the context of concern about other global issues such as AIDS and terrorism, allowing for comparison of the relative levels of concern about different issues. Respondents were asked to give their contact details if they were willing to take part in a follow-up survey.

Ten weeks after the end of the initial period of data collection, respondents who had given their contact details were sent an email with a link to a web-based follow-up questionnaire. This contained the same two questions about concern, beliefs and motivation as on the first two questionnaires, and multiple-choice questions about actions in four categories: raising awareness and lobbying politicians; home energy use; travel; and food. Respondents were given a unique number to input at the start of the questionnaire so their responses could be matched to the earlier questionnaires. Seventeen people who gave only a postal address were sent a paper version with a stamped addressed envelope to return it. As an incentive, respondents were offered the opportunity to have their name entered into a draw for a chance to win one of three £10 vouchers. Two reminders were sent. The deadline was 29 June 2009, approximately 14 weeks after the film was viewed.

The first two questionnaires (referred to below as 'Q1' and 'Q2'), were completed by 241 people, of whom 213 gave their contact details to be included in the follow-up. Of these, 162 completed the follow-up questionnaire ('Q3'), 67.2% of the initial sample.

4.3 Results: before and after questionnaires

4.3.1 Characteristics of survey respondents

Table 4 (p. 107) details the socio-demographic characteristics of the survey respondents. Respondents were most likely to be aged 25–34, with other age groups fairly evenly represented. The sample was skewed towards females, and respondents were more highly educated and more likely to be employed in managerial/ professional occupations than the population of Edinburgh in the 2001 census. In the last year, 61.8% had donated money to "a local or national group that campaigns partly/wholly about climate change/global warming", and 36.1% stated that they were "actively involved (e.g. writing letters/attending events/taking personal action)" in such a group.

Interest in or concern about climate change was cited by 77.6% of respondents as a reason for coming to see the film, with 60.9% giving this as the main reason ($n = 230$; 11 people did not give a 'main reason'). Alternative primary reasons why

people attended were "It was recommended by someone I knew" (17.0%), "I was invited to come with someone else" (11.3%) and other reasons (10.8%), including having seen the website or the trailer; heard about the film on the radio or through a review, blog or social networking site; or liked other films featuring Pete Postlethwaite.

Table 4: Socio-demographic characteristics of respondents

		% of responses	
		Q1 and Q2 (n = 241)	Q3 (n = 162)
Gender	Female	56.0	56.2
	Male	38.6	40.1
	Not given	5.4	3.7
Age	16–24	13.3	13.0
	25–34	23.2	24.7
	35–44	17.0	19.1
	45–54	14.9	13.0
	55–64	16.2	16.0
	65+	13.3	13.0
	Not given	2.1	1.2
Education	First degree/masters	68.5	68.5
	PhD	10.0	9.9
	Lower qualifications	15.3	14.8
	Not given	6.2	6.8
Occupation	Managerial/professional[a]	49.0	50.0
	Retired	17.4	17.3
	Student	13.3	14.2
	Intermediate occupations[a]	10.8	9.2
	Routine/manual occupations[a]	2.5	3.1
	Unemployed	1.2	1.2
	Homemaker	0.4	0
	Not given	5.4	4.9

[a] Occupations given were allocated to these classes as accurately as possible according to the National Statistics Socio-economic Classification (NS-SEC). Where it was not possible to determine the skill level of jobs which might be classed as either managerial/professional or intermediate, they were classed as managerial/professional, and thus this category might be inflated.

4.3.2 Concern about climate change

Respondents were asked about their level of concern about climate change and other global issues (AIDS, species extinctions, 'credit crunch'/recession, poverty, and terrorism) on all three questionnaires. Concern about climate change was very high even before seeing the film (see Table 5, p. 108). There was a slight increase in

the proportion of respondents who stated that they were "very concerned" immediately after seeing the film, but this did not prove significant using the Wilcoxon signed ranks test. Anticipating a 'ceiling effect', whereby respondents might feel heightened concern after the film but for this not to show up on a Likert-type scale if many had already chosen the highest point before the film, participants were asked to state directly on the second questionnaire whether their concern about climate change had increased. Of the 241 respondents, 17.4% replied "No", but 30.3% ticked "Yes, a bit" and 52.3% stated "Yes, a lot". These results need to be interpreted with caution, in that respondents may well have been sympathetic to the intentions of the film and so inclined to credit it with this effect, but the responses to the question about what message respondents were taking away from the film also suggest heightened concern (see section 4.3.5).

Table 5: Respondents' concern about climate change

Level of concern	% of responses		
	Q1 (n = 241)	Q2 (n = 240)	Q3 (n = 162)
Not at all concerned	0	0	0
Not very concerned	0.4	0	0.6
A little concerned	2.9	2.1	4.3
Somewhat concerned	14.9	14.6	13.6
Very concerned	81.7	83.3	81.5

On all three questionnaires, the proportion of respondents who were either "somewhat" or "very concerned" about climate change was higher than for any of the other issues they were asked about, with poverty coming second and terrorism lowest.

4.3.3 Changes in motivation, knowledge, fear and agency

Respondents were asked on all three questionnaires to indicate their agreement on a 7-point Likert-type scale (from "strongly disagree" to "strongly agree") with the statements shown in Table 6 (p. 109). Even before seeing the film, most participants felt motivated to do something about climate change, agreed that they knew what to do to reduce their carbon emissions, and felt a sense of agency, believing that they could do something and that it was worth taking action; they also feared that humanity will not do enough to prevent catastrophic climate change (see Table 6).

Changes in responses between the first and second questionnaires were analysed using the Wilcoxon test and it was found that immediately after seeing the film respondents felt increased motivation to act ($z = 5.004$, $p < 0.001$)[2], and had an increased sense that they can do something about climate change ($z = 4.203$, $p < 0.001$). On the other hand, they were less likely to agree that they do as much as they can about climate change ($z = 5.655$, $p < 0.001$). There were no significant changes in agreement with the other statements. However, in a separate question, 15% of respondents agreed with the statement "I feel more confused about what I can do about climate change/global warming" and 11.3% agreed that "I feel less convinced that there is any point in trying to reduce my carbon emissions".

Table 6: Percentage of respondents who agreed with the statements listed (Q1: *n* = 231–237; Q2: *n* = 234–237; Q3: *n* = 161–162)

Statement	Q1	Q2	Q3
I feel motivated to try to do something about climate change/global warming	90.2	95.8	91.4
I can do something to prevent climate change/global warming getting worse	85.7	93.6	87.8
I know what I can do to reduce my carbon emissions	92.3	92.3	92.5
Cutting my carbon emissions won't make a difference to the problem of climate change/global warming	21.3	20.5	19.2
It's worth lobbying politicians about climate change/global warming	89.0	90.7	82.8
I do as much as I can about climate change/global warming	64.5	52.8	57.7
I fear humanity will not do enough to prevent catastrophic climate change/global warming	84.7	88.1	85.1

4.3.4 Beliefs about catastrophe and responsibility

One of the most striking results was that, having seen the film, a large majority of respondents believed that there is a significant possibility of the kind of devastation shown in the film, by 2055 (Table 7, p. 110). Only 7.5% of those who answered said they thought there was a less than one-in-three chance that this could occur.

On the second questionnaire, participants were asked whose responsibility it is to reduce GHG emissions. This was an open question in order to see how people would reply unprompted. Most (87.1%; $n = 232$) believe that at least some

[2] All p-values are for two-tailed tests unless otherwise stated.

responsibility belongs with individuals: the most commonly assigned code was "everyone" (49.6% of responses) with 12.5% saying "everyone, but government must take the lead," and various other answers including "individuals" and "mine". Responsibility was attributed to someone other than individuals (businesses and/or government) by 10.3% of respondents, and two persons expressed doubts that human activity causes climate change.

Table 7: Responses to the multiple-choice question on Q2, "How likely do you think it is that the world could be devastated by climate change/global warming and related problems, in the way it is in the film, by 2055?" (*n* = 228)

Likelihood	% of responses
Virtually certain (over 99% chance)	8.3
Very likely (90–99% chance)	32.9
Likely (66–90% chance)	29.4
Medium likelihood (33–66% chance)	21.9
Unlikely (10–33% chance)	5.3
Very unlikely (1–10% chance)	1.8
Extremely unlikely (less than 1% chance) (one person)	0.4
Impossible	0

4.3.5 Overall message: "Do something now!"

An open question on Q2 asked "What message are you taking away from the film?" (see Table 8, p. 111). The need for action was the most frequent theme: the words 'action' or 'act' made 48 appearances in the responses, while the injunctions 'do something', 'do more' and 'do what you can' appear 25 times. The action category was subdivided into three. Responses where it was clear that the respondent was commenting on what they themselves would do, or about the need for personal responsibility, comprised the largest subgroup. Examples include "I will try even harder to reduce my CO_2 emissions" and "It is your personal duty to do what you can". A second subgroup consisted of general statements such as "We need to take drastic action", while the third subgroup contained specific suggestions for action that were not personal, or not clearly so, e.g. "UK must promote wind farms!" and "Don't fly!" Comments about lobbying politicians and 'spreading the word' were also common and were coded as distinct categories. Imperative words were often used, 'need' being the fourth most commonly found word, with 37 instances, while 'must' appeared 19 times.

Another widespread response was a sense of urgency, typical comments being "The time to act is now!" and "Time is *NOT* on our side." The word 'now' was the fifth most commonly used in all responses, appearing 31 times; 'urgency' or 'urgent' appeared 14 times.

Table 8: Most common responses to the open question on Q2, "What message are you taking away from the film?" (*n* = 224)

Code assigned	No. of instances	% of responses[a]
Action!	81	36.2
- Personal action/responsibility	36	16.1
- General ("do something")	30	13.4
- Specific but not (necessarily) personal	15	6.7
Urgency	50	22.3
Depressed/doubting what it is possible to achieve	26	11.6
Lobby politicians	20	8.9
Spread the word	19	8.5

[a] These percentages do not sum to 100 as responses could be allocated more than one code and not all responses are included.

Just over one-tenth of respondents expressed a sense of depression, or doubts that enough could be done to prevent catastrophe, typical comments being "Initial reaction is intense depression and cynicism. The message is that we must *all* do something – and I find it hard to believe enough people will do so to convince governments and industry to make the hard decisions we need" and "It is quite a bleak film."

4.4 Results: follow-up questionnaire

As can be seen from Table 4 (p. 107), the socio-demographic characteristics of those who responded to the follow-up questionnaire were very similar to the original sample. However, they were a slightly more concerned and engaged group: 65.4% (compared to 61.8% of the original sample) had donated money in the last year to an organisation campaigning on climate change, 39.5% (36.1%) had stated on Q1 that they were actively involved in such a group, 81.5% (77.6%) gave concern about climate change as one reason for coming to see the film while for 65.8% (60.9%) it was the main reason, and 84.6% (81.7%) had stated that they were "very concerned" about climate change before seeing the film.

In the analysis that follows, only the 162 'before' and 'after' questionnaires which were matched with a completed follow-up questionnaire are included.

4.4.1 Do the effects of the film last?

The Friedman test (a nonparametric version of analysis of variance) was used to determine whether there were overall differences between all three questionnaires in respondents' levels of concern, motivation to act, knowledge about what to do, fear, and sense of agency. Where significant differences were found, this justified using the Wilcoxon test to examine the significance of differences between Q3 and Q1 or Q2 separately.

The hypothesis was that any heightened concern about climate change and motivation to act that was felt immediately after the film would not persist. There was indeed a decrease in concern about climate change between Q2 and Q3 ($z = 2.548$, $p = 0.006$)[3], although only 26 respondents (16.0%) chose a different point on the scale. There was no significant difference in concern about climate change between the follow-up and the first questionnaire. The hypothesis that motivation to act would fade was accepted on the strength of a Wilcoxon test ($z = 4.192$, $p < 0.001$)[3], and the increased belief that "I can do something" reported immediately after the film was also reversed ($z = 3.987$, $p < 0.001$). There was no difference in the level of agreement with these statements between Q3 and Q1. By the time of the follow-up, respondents' belief that "It's worth lobbying politicians about climate change" had decreased compared to both the initial level ($z = 3.968$, $p < 0.001$) and the level immediately after seeing the film ($z = 3.610$, $p < 0.001$). A possible explanation for this is that news of the UK MPs' expenses scandal broke between the screening of the film and the completion of Q3. A less significant result was that agreement with the statement "I do as much as I can about climate change", which had fallen immediately after seeing the film, had risen again by the time of the follow-up ($z = 2.057$, $p = 0.040$), although it was still lower than it had been before the film ($z = 2.222$, $p = 0.026$).

[3] One-tailed test.

4.4.2 Behavioural changes

Table 9 (p. 114) shows responses to the questions about specific actions that respondents might have done or be doing. There are of course drawbacks to using self-report measures of behaviour (Manfredo and Shelby, 1988), but there was no practicable alternative. On the questionnaire it was stressed that "Not all will necessarily be possible for you, or you may not want to do them", to avoid suggesting an expectation that respondents should be engaged in such behaviours. In each section (awareness raising and lobbying; home energy use; travel; food) a range of behaviours was selected, from those thought likely to be least costly in terms of time, effort or money, to those that would likely be more difficult. The majority of these relate to the 'headline behaviour goals' identified by Defra (2008a) for policy and communications to focus on.

The most common response to the first action(s) in each section was "I have done/am doing this, but not because of seeing the film," and to the harder/more expensive options was "I have not done/am not doing/can't do this". For every action there were some participants who reported "I have done this/am doing it more, because of seeing the film"; they were generally a small proportion of the total, decreasing as the behaviours got harder.

An interesting exception to this pattern is that 29 people (17.9% of respondents) said they were "Planning/taking holiday(s) without flying this year" and 35 people (21.9% of respondents) stated that they had "Decided to reduce/cut out holiday flying long term" as a result of seeing the film. This was a bigger effect than for almost all other actions, and, given the GHG emissions associated with flying, could result in respondents significantly reducing their carbon footprints if they followed through on their intentions. It is of course easier to state an intention than to actually carry out an action, and some participants may rationalise decisions not to fly as being for environmental reasons when other factors (such as the recession) were also important.

Table 9: Responses to multiple-choice questions about specific behaviours (*n* = 160–162)

	Not done/doing	Done/doing more, due to film		Done/doing but not due to film
	%	%	No.[a]	%
Awareness raising/lobbying politicians				
Trying to raise awareness among people I know	14.2	27.8	(45)	**58.0**
Sent message to politician(s) – last 12 months	**53.7**	12.3	(20)	34.0
Actively involved in campaigning group	**59.6**	4.3	(7)	36.0
Attended rally outside Scottish parliament	**81.4**	7.5	(12)	11.2
Calculated 'carbon footprint' – last 12 months	**65.0**	6.3	(10)	28.8
Home energy use				
Installed low energy light bulbs – most/all lights	5.6	6.2	(10)	**88.3**
Turned down heating/cut time heating on	3.7	9.3	(15)	**87.0**
Washing clothes at 30°C (usually/always)	26.9	10.0	(16)	**63.1**
Drying clothes on rack (usually/always)	6.2	3.1	(5)	**90.7**
Installed more insulation/draught-proofing	**55.9**	2.5	(4)	41.6
Changed to 'green electricity' supplier/tariff	**64.4**	4.4	(7)	31.3
Generating energy through home renewables	**93.2**	1.2	(2)	5.6
Travel				
Cut down/avoid driving	6.8	11.7	(19)	**81.5**
Car sharing/car club (leave blank if never drive)	**66.9**	0.8	(1)	32.2
Planning/taking holidays without flying this year	**42.6**	17.9	(29)	39.5
Decided to reduce/stop holiday flying long term	**40.6**	21.9	(35)	37.5
Food				
Avoiding buying bottled water	14.2	15.4	(25)	**70.4**
Buying more local produce	12.3	17.9	(29)	**69.8**
Reduced meat consumption/eat vegetarian/vegan	27.8	8.6	(14)	**63.6**
Composting food waste	**49.1**	2.5	(4)	48.4

Note: The most common response to each statement is highlighted in bold.
[a] Number of respondents who attributed behavioural changes to the film.

4.4.3 Correlates of behaviour

In order to explore what factors are related to changes in behaviour as a result of the film, a 'film action' variable was constructed. A score of 1 was given for each action that respondents stated they were doing because of seeing the film, 0 for other answers (or no answer). These scores were added for all actions, and ranged from 0 to 14 out of a possible total of 20 (mean 1.9, SD 2.4). Respondents were divided into three groups: those who scored 0 (65 respondents, 40.1%), participants who had carried out 'some' actions, scoring 1–4 (78 respondents, 48.1%), and those who had a 'high' score, from 5 to 14 points (19 people, 11.7%). A 'prior action' variable was also constructed in a similar way, where a score of 1 was assigned to each action respondents said they were taking but not because of seeing the film (mean 10.3,

SD 3.6). Respondents were categorised as having a 'low' score (<6, 11 respondents, 6.8% of the sample), 'medium' (6–14, 132 respondents, 81.5%) or 'high' score (>14, 19 respondents, 11.7%). The gamma statistic *G* was then used to test the relation between respondents' action scores and other ordinally-scaled variables, while Cramér's *V* was used to measure the degree of correlation between action scores and nominal variables such as gender.

It seemed likely that one significant factor affecting scores for action taken as a result of the film would be the level of action participants were already engaged in, and this proved to be the case. There was a strong negative correlation between the 'prior action' score and the 'film action' score ($G = 0.764$, $p < 0.001$): 89.5% of those who had a high 'prior action' score scored 0 for 'film action' compared to 18.2% of those who had a low 'prior action' score; no-one who had a high 'prior action' score scored highly for actions taken as a result of seeing the film, but 45.5% of those with a low 'prior action' score gained a high 'film action' total.

Women were somewhat more likely to have higher 'film action' scores than men ($V = 0.250$, $p = 0.008$); 15.4% of women had a high score, compared to 7.7% of male respondents, while 55.4% of men scored 0 compared to 30.8% of women. Conversely, men were somewhat more likely to have a high 'prior action' score ($V = 0.243$, $p = 0.010$), with 20.0% of men having a high score compared to 5.5% of women. There was no correlation between action scores and whether respondents could reasonably expect to be alive in 2055 (those aged up to 34) or would be beyond average life expectancy by then. There was also no correlation between 'film action' scores and whether participants had donated money to, or were involved in, an organisation campaigning about climate change. However, there was a correlation between having given a donation or being actively involved in a group and having a high 'prior action' score ($V = 0.207$, $p = 0.032$ and $V = 0.306$, $p = 0.001$ respectively). Although this correlation does not prove causality, it accords with the findings of Olli et al. (2001) that involvement in such groups is a significant predictor of pro-environmental behaviour (and suggests that, having already taken many actions, participants involved in groups did not have the opportunity to take many more after seeing the film).

There was a moderate correlation between 'film action' scores and participants' beliefs about the likelihood of worldwide devastation by 2055 ($G = 0.309$, $p \approx 0.007$)[4]: 18.6% of participants who thought that it was "very likely" or "virtually certain" such devastation could occur had a high score, compared to only 8.3% who rated it as "unlikely", "very unlikely", "extremely unlikely", or "impossible". There was no correlation between 'prior action' scores and such belief. There was also no correlation between action scores and levels of agreement with the statement "I fear humanity will not do enough to prevent catastrophic climate change/global warming" on any of the three questionnaires. Looking at levels of concern about climate change, respondents who reported more concern on Q1 had higher 'prior action' scores ($G = 0.549$, $p \approx 0.036$) and there was also a positive correlation between higher 'film action' scores and level of concern on Q2 ($G = 0.441$, $p \approx 0.024$) and Q3 ($G = 0.422$, $p \approx 0.018$).

Agreement on Q1 with the statements "I feel motivated to try to do something about climate change/global warming", "I can do something to prevent climate change/global warming getting worse", "I know what I can do to reduce my carbon emissions" and "I do as much as I can" was positively correlated with 'prior action' scores ($G = 0.439$, $p \approx 0.003$; $G = 0.291$, $p \approx 0.031$; $G = 0.694$, $p < 0.001$; $G = 0.421$, $p \approx 0.003$). It is perhaps not surprising, therefore, that there was no significant correlation between 'film action' scores and agreement immediately after the film with the statements "I can do something to prevent climate change/global warming getting worse" or "I know what I can do to reduce my carbon emissions". However, the higher the level of agreement with the statement "I feel motivated to try to do something about climate change/global warming" on Q2 (immediately after seeing the film), the more likely respondents were to have higher 'film action' scores ($G = 0.369$, $p \approx 0.002$): 16.3% of those who strongly agreed had a high score and 52.2% had taken some actions, whereas a majority (59.1%) of those who disagreed, felt neutral, or only slightly agreed, scored 0.

Respondents who felt more confused about what to do to cut their emissions, had less confidence that there was any point in doing so, or who felt the overall message of the film was depressing, did not take significantly less action after seeing

[4] All p-values for the G statistic are approximate but conservative, i.e. the results are at least as significant as stated.

the film than others. This may be because levels of knowledge and belief in the efficacy of action were high enough before seeing the film that even though it had a negative effect for some people, the effect was not enough to put them off action.

4.4.4 Barriers to change

On Q3, respondents were asked in each action section whether they would like (or felt it necessary) to do more, and if so, what, if any, are the main obstacles that prevent them (see Table 10, below). A large majority of respondents said they would like to take more action.

Table 10: Barriers to action as a percentage of number of respondents who said they would like to do more, in each section

	Raise awareness/lobby	Home energy use	Travel	Food
% respondents who would like to do more	71.6	90.7	76.5	77.2
Barriers				
Cost	12.9	**51.0**	37.1	33.6
Lack of options	12.1	31.3	**46.8**	**42.4**
Lack of information	19.8	23.1	11.3	29.6
Inconvenience/discomfort	19.8	15.0	37.1	22.4
Lack of time	**70.7**	19.7	21.0	17.6
No point at the moment	4.3	2.0	0.8	1.6
Other	13.8	21.8	13.7	12.8

Note: The most common barrier in each section is highlighted in bold.

In the home energy section, 19 people specifically mentioned that their options were limited by being a tenant, and others mentioned planning permission/ conservation status issues. Regarding travel, five people mentioned having family abroad as a barrier to reducing emissions, and seven said their work required flying.

4.5 Discussion

4.5.1 Concern, fear, motivation, and agency

Clearly *The Age of Stupid* attracted a particular type of viewer, at least during the opening week of the film. Many would seem to belong to Leiserowitz's 'alarmist interpretive community': those who have a high risk-perception concerning climate change and are more likely to have taken personal action and to support government

policies to mitigate the problem (Leiserowitz, 2007c). In terms of Defra's (2008a) environmental segmentation model, viewers appear to be 'positive greens' and 'concerned consumers' (who are most willing and able to act), with some 'sideline supporters'. Climate change is now recognised as an issue of concern by many of the UK public: for example, 57% of respondents in a Scottish survey agreed with the statement "Climate change is an immediate and urgent problem" (Scottish Government, 2008). However, participants in my study exhibited particularly high levels of concern about climate change, and, unlike participants in other studies (Defra, 2007, 2009; Lorenzoni and Pidgeon, 2006; Lowe et al., 2006; Norton and Leaman, 2004), expressed more concern about climate change than about other issues.

In this they were unlike UK audiences who saw *The Day After Tomorrow*. Lowe et al. (2006) found that only 5% of their sample went to see that film because they were interested in climate change or environmental films, and their respondents expressed higher levels of concern about terrorism and AIDS than about climate change, before seeing the film. Balmford et al. (2004) assessed levels of concern by asking viewers to state how they would allocate £1000 to five different 'good causes', and found that, before respondents had seen the film, climate change was the least popular cause out of 'health', 'animal welfare', 'UK social', 'climate change' and 'international aid' (personal communication, 2010). Even in Germany, where Reusswig et al. (2004) found that the most common reason for seeing *The Day After Tomorrow* was "I'm interested in the climate issue", the proportion of respondents who gave this reason was only 35.9% – less than half the proportion of viewers who came to see *The Age of Stupid* because of concern about climate change – and almost matched by the proportion who said "I like disaster movies" (34.5%). Unlike *The Day After Tomorrow*, *The Age of Stupid* appears to have been largely 'preaching to the converted'.

The relative success of *The Day After Tomorrow* in reaching an audience not already especially concerned about climate change may suggest that climate change communications would benefit from being packaged in a more populist format, or within a fictional frame. However, the fictional element of *The Age of Stupid* – the portrayal of devastation in 2055, accompanied by comments from Postlethwaite's

character such as "It's like looking through binoculars observing people on a far-off beach, running around in circles, fixated on the small area of sand under their feet as a tsunami races towards the shore" (which may give a misleading impression of the speed at which changes could take place) – has been criticised by some commentators. Wehner (undated) argues that "Given how central the catastrophic failure of society is to the film's message, this alarmist film is more likely to fuel the arguments of climate change skeptics rather than foster informed and productive discussions of this extremely important issue." Alternatively, another reviewer, climatologist Stephen Schneider, says: "Although one needn't take the detailed future scenes literally as mainstream projections, please do take seriously the message that our greed and neglect is no gift to our children and grandchildren…" (Schneider, undated). Although *The Age of Stupid* filmmakers believe that climate science does not contradict their film (on the website, Lynas (2009) defends the portrayal of devastating impacts), the film raises important questions about the tradeoffs between presenting complex scientific information and engaging/ motivating people using vivid imagery, and about whether it is desirable, or justifiable, to present extreme scenarios in climate change communications in order to try to convince the audience of the urgency of the issue. Lowe et al. (2006) suggest that the portrayal of extreme, unlikely impacts leads to disbelief and denial about climate change – three of the studies on *The Day After Tomorrow* found a decrease in the perceived likelihood of climate change among viewers (Lowe, 2006). Viewers of *The Age of Stupid* who accepted as likely the devastation portrayed seem to have been inspired to take more action after seeing the film than those who thought such a scenario unlikely (see section 4.4.3). However, some critics may still be uneasy at what they see as sowing of misinformation.

It is interesting that so many engaged and highly educated respondents in this study believe that world devastation on the scale depicted by *The Age of Stupid* could happen by 2055. Although the impacts of worst-case emissions scenarios are predicted to be severe, devastation of such magnitude is not likely within this time frame (Betts, undated; IPCC, 2007b). Respondents' perceptions might be a reflection of the climate change discourses that are prevalent in the media, highlighting potential disasters and the threat of passing a 'tipping point' (Boykoff, 2008; Russill

and Nyssa, 2009). Indeed, the recent rise in coverage of climate change in the UK quality press has mostly been of 'potential catastrophe' and other crisis discourses (Doulton and Brown, 2009). Some of the organisations that many respondents have donated money to or are actively involved in also employ disaster narratives and imagery to appeal to the public. For example, a current (October 2009) Christian Aid poster reads: "Our actions are destroying more than just icebergs. Climate change could push 250 million sub-Saharan Africans into poverty by 2020." Thus the narrative strand of the film is congruent with messages that participants may be receiving from trusted others.

Despite anxiety that the use of shocking images and disaster narratives reduces efficacy to act because people feel overwhelmed and have a reduced sense of agency (Lowe, 2006; Moser, 2006; Moser and Dilling, 2004; Nicholson-Cole, 2005), this largely does not appear to have happened in this case. The film did not seem to increase viewers' fears that humanity will not do enough to prevent catastrophic climate change. Respondents emerged from the film with increased motivation to take action, and an increased belief that they could do something to prevent climate change getting worse, along with a sense that they are not already doing everything they can. Those who had expressed higher levels of concern or belief in the likelihood of devastation on Q2 did then apparently take more actions as a result of seeing the film. This can perhaps be explained by the fact that most respondents felt that they knew what to do to reduce their emissions before seeing the film, so they were not left facing images of devastation without having much idea whether or how they could prevent it. It might also be because a significant proportion of viewers were involved in, or had some contact with, organisations that campaign about climate change, providing them with not only information about what to do, but moral support and encouragement (Howell, 2009; Moser, 2006). The relatively high level of action that respondents were already engaged in before seeing the film may have helped them take more action afterwards because of the enabling 'tacit knowledge' that their previous actions would have developed (Darby, 2006a).

4.5.2 Responsibility

For a significant proportion of viewers, the main message they were taking away from the film was the need to take (more) personal action themselves, both to reduce emissions and to lobby politicians and 'spread the word' about the need for action. In comparison, in surveys of environmental attitudes and behaviours with representative samples of the general population, 28% of respondents in England and 35% of respondents of Scotland agreed with the statement "I don't believe my everyday behaviour and lifestyle contribute to climate change" (Defra, 2009; Scottish Government, 2008), suggesting that the general public would be less likely to accept personal responsibility for reducing emissions.

It is notable that 12.5% of respondents suggested that the government must take the lead on emissions reductions, although everyone is responsible. This attitude is commonly found in other studies (e.g. Lorenzoni et al., 2007; Nicholson-Cole, 2005). High levels of support exist for many aspects of state intervention for the common good (Halpern and Bates, 2004), while the main barriers respondents reported to taking action to reduce emissions were cost and lack of options – factors perceived to be beyond the control of individuals, requiring government intervention. Given the already low levels of trust in politicians, and engagement with political processes, the marked decline on Q3 in agreement that it is worth lobbying politicians is concerning.

One in ten filmgoers in this study attributed responsibility solely to governments and/or businesses. This compares with 24% of respondents who placed responsibility with governments/world leaders after seeing *The Day After Tomorrow* (Lowe et al., 2006). The difference may reflect both the different audience for the two films and changes in public knowledge and perceptions since that film was released in 2004.

4.5.3 Action

An evaluation of the efficacy of the film in promoting action and behavioural changes would seem to depend on whether one has a 'glass half empty' or a 'glass half full' perspective. On the one hand, for every action/behaviour asked about on

Q3, a large majority of participants stated either that they were already doing it, or that they had not done it/were not doing it. The kind of people who came to see the film were already engaged in lower-cost actions, and the film did not result in many of them beginning to engage with the more costly behaviours, at least in the 10–14 weeks following the film. Arguably, since concern and motivation to act had dropped back to their initial levels by this time, most respondents who had not begun to take action because of the film would not later do so (although the film could be part of a 'drip drip' effect of repeated messages that might later make action due to another stimulus more likely). The proportion of respondents who attributed action to having seen the film was rarely above 10%, and generally rather lower than this.

On the other hand, it could be argued that results such as 11.7% of respondents cutting down on driving and 8.6% reducing their meat consumption represent considerable success: this could mean not only notable reductions in the carbon footprints of those individuals, but also contribute to changing social norms, which are an important influence on behaviour (Bamberg and Schmidt, 2003; Lucas et al., 2008; Prendergrast et al., 2008).

The responses about flying are particularly interesting, since reducing flights would likely make a big difference to an individual's carbon footprint. Choosing not to fly was modelled in the film by a couple who travelled from the UK to France by train, and four people commented without prompting about the need to reduce/stop flying when asked on Q2 about the overall message they were taking from the film. A study of individuals involved in Carbon Rationing Action Groups (groups of concerned citizens who set themselves a voluntary carbon 'ration' each year), found that most had reduced or cut out flying altogether once they realised the difference it would make (Howell, 2009). Any suggestion of measures to reduce flying meets strong opposition: for example, David Cameron's proposal for a tax on flights was branded a "tax on fun" (Kite et al., 2007); yet once the potentially difficult decision not to fly has been taken it is a low- or no-cost action in terms of money and effort (unless a long-distance overland journey is taken instead).

One interesting finding was that a larger proportion of men than women had high scores for action taken before the film. This would appear to run counter to studies which find that women express more willingness to adopt pro-environmental

behaviours than men (Kollmuss and Agyeman, 2002; O'Connor et al., 1999). However, it may just indicate that the men who attended the film were particularly unrepresentative of men in general. The relationship is also complex, in that there were also a higher proportion of men than women who had *low* 'prior behaviour' scores, and proportionally more women than men who had medium scores.

This survey was not able to explore barriers to action in detail but it gives an overview of some of the issues. An interesting result is that "lack of information" is cited as the second or third most important barrier in each section except travel. One could argue, therefore, that the 'information deficit' model of (lack of) behaviour change is vindicated to a certain extent, so the government has been right to run campaigns aimed at providing more information in the hope of altering behaviour. However, it might be that people use 'lack of information' as an excuse for inaction. Alternatively, there may be sufficient information but the public has difficulty in accessing it or in using it in such a way as to take action.

A related issue is the limits of media such as films (or other one-off presentations of information) to influence behaviour. Research about advertising suggests that people need to see messages more than once in order to remember and respond to them (Vakratsas and Ambler, 1999; Zielske, 1959), although the effects of a film which is deliberately watched may be different from those of a brief advertisement. Perhaps more importantly, reading a leaflet, viewing a television advertisement, or watching a film impact on individual cognition (although the effect of experiencing the film as part of an audience, rather than alone, would be interesting to research), but then routine practices and social context come into play. A wide range of factors, such as social norms and conventions (Cialdini et al., 1990; Heiskanen et al., 2010), habits (Bamberg and Schmidt, 2003; Heimlich and Ardoin, 2008), and the kind of barriers explored in this study, mediate the effects of communications and resulting attitudes on actual behaviour. Probably as a result, this study, in common with others (Heath and Gifford, 2002; Lindenberg and Steg, 2007; Whitmarsh, 2009a), found that where there is some evidence of a link between attitudes and pro-environmental behaviour, it tends to be less costly behaviour in terms of time, money, or effort.

A single film is likely to have only a small effect overall (and a study like this cannot disaggregate all possible other influences on participants' behaviour); the influence it may have needs to be supported by other interventions. Habit is such an important factor that it is useful to encourage people to make public commitments and 'implementation intentions' regarding action (Bamberg, 2000; Gollwitzer and Brandstätter, 1997; Heimlich and Ardoin, 2008), and to provide prompts (McKenzie-Mohr, 2008) and feedback. The latter might be merely descriptive feedback, e.g. about levels of energy use (Darby, 2006b) or might also include injunctive messages about how well the recipient is doing (Ayers et al., 2009; Schultz et al., 2007). Being part of a community group/network is also an important influence on behaviour (Middlemiss, 2008; Olli et al., 2001). The filmmakers did try to address this to some extent by encouraging campaign groups to be present at screenings in order to let viewers know what local action they could get involved with. Future work will examine the rate of viewer sign-ups to such groups and the 10:10 campaign, and whether involvement in these persists and correlates with behavioural changes.

4.6 Conclusions

The Age of Stupid attempts to convince viewers to take action to mitigate climate change using an appeal based on the need to avoid disaster. Among the viewers that this study surveyed, it does seem to have had some success in raising levels of concern and motivation to act immediately after seeing the film. Furthermore, 60% of respondents to the follow-up questionnaire attributed at least one action they are taking (or doing more of), either to raise awareness about climate change and lobby politicians, or to reduce their carbon footprint, to the effect of having seen the film. However, heightened levels of concern and motivation were no longer in evidence at the time of the follow-up survey, 10–14 weeks after the release of the film, and the actions or behavioural changes that respondents were most often engaged in are those that require less effort, money or time.

The filmgoers surveyed were a very particular group, not representative of the general public. They exhibited very high levels of concern about climate change and motivation to act to mitigate it, even before seeing the film. A significant proportion were actively involved in, or had given a donation to, groups campaigning wholly or

partly about climate change. Therefore it is not possible to assume that these findings would be true of an audience more similar to the general population.

Arguably, the film may have been successful in motivating these viewers to take more action because (a) it offers information that is already accepted by this group; (b) the 'disaster narrative' element of the film may be familiar and therefore less overwhelming than it would otherwise have been; (c) these viewers largely accept personal responsibility for reducing GHG emissions; (d) they already knew how to take action; and (e) a significant proportion have the support and encouragement that comes from being associated with or actively involved in a group campaigning on these issues. The question remains whether the film, or other climate change communications framed in a similar way, would achieve the same response from members of the general public for whom these statements are not true. Research by Stoll-Kleemann et al. (2001) on the psychology of denial concerning climate change mitigation suggests that if people do not believe that their actions will make a difference, unlike most of the filmgoers in this study, they are less likely to take action. Also, one of the two characters in the film who was trying to mitigate climate change, personally as well as through his work, was a wind farm developer. Since wind farms are controversial in the UK (Devine-Wright, 2005; Warren and Birnie, 2009), he did not represent a positive role model for certain viewers to identify with. Future communications may need to focus more on presenting positive stories of how 'ordinary people' (not 'environmentalists') have taken action for a variety of reasons, thus promoting and utilising the power of constructive social norms.

Given that lack of information was cited by respondents as one of the main barriers preventing further action in various areas, it seems likely that viewers who start from a position of knowing less about possible actions would find it harder to achieve behavioural changes. Leo Murray, one of the film-makers, recognises that "The film frightens people but doesn't give much of a steer about what to do" (personal communication, 2009). The film has also been criticised for offering only a vision of what we want to avoid, rather than images of a positive future we want to achieve (Brant, 2009). Hence the launch of the 10:10 campaign, which aims to provide a positive, aspirational message about what to do, that will appeal to people

who do not self-identify as 'activists' or 'environmentalists' (Leo Murray, personal communication, 2009). Climate change campaigners and policymakers should bear in mind that, as 'the public' is heterogeneous as regards not only knowledge but also values, climate change risk perceptions etc. (Leiserowitz, 2006; Michaelis, 2007), it is likely that a variety of messages will be needed to appeal to a wide audience. There is also work to be done at the policy level to remove barriers such as cost and lack of options that were reported as preventing further action even by this sample of motivated individuals.

This study contributes to research on the effectiveness of visually-based and emotionally-engaging climate change communications in changing attitudes and behaviour. In common with other studies (Leiserowitz, 2004; Lowe et al., 2006; O'Neill and Hulme, 2009), this research found evidence of increased concern as a result of the 'intervention' under examination, although there is an issue about the persistence of this effect. I also explored participants' sense of agency, which has been less extensively researched than concern about climate change, despite being an important factor in pro-environmental behaviour (though see Nicholson-Cole, 2005 for evidence about visualisations of climate change compared to self-efficacy). Concerns that viewers might be overwhelmed by the shocking images and feel less convinced that it is possible or worthwhile for them to take action do not seem to be supported by my evidence, but given the characteristics of the audience, climate change communicators should be wary of assuming this refutes other findings on the problems of fear appeals (Moser, 2007 provides a useful overview). This study extends previous research by examining whether the observed increased concern and motivation to act did actually translate into behavioural changes, and found mixed results. Follow-up research will investigate whether respondents maintain behavioural changes that they have made, and whether they act on their stated intentions regarding flying.

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4.7 Correction to Paper 1 (post-publication)

An adjustment for multiple testing should have been applied to the statistical tests reported in this paper, in order to control the familywise error rate at $\alpha = 0.05$ (i.e. in order to ensure that the probability of making one or more false discoveries – Type I errors – was not inflated because multiple pairwise tests were performed). Applying a Holm's (1979) sequentially rejective Bonferroni adjustment leaves the results the same except that the differences in agreement with the statement "I do as much as I can about climate change/global warming" between the follow-up (Q3) and immediately after the film (Q2), and between Q3 and the baseline (Q1) are no longer deemed significant (i.e. the last sentence of section 4.4.1 is incorrect). However, since agreement with this statement on Q2 *was* significantly lower than on Q1, there must be some real difference between the scores for other questionnaires: if there is no significant difference between the results for Q3 and Q2, agreement on Q3 must be lower than on Q1; conversely, a lack of significance in the score difference between Q3 and Q1 means that agreement had returned to the baseline level, so that the results for Q2 and Q3 should be significantly different.

There are two possible explanations for the apparently contradictory results of the statistical tests. Firstly, it is possible that, as suggested in section 4.4.1, agreement with this statement did increase by the time of the follow-up, though not enough to return to the baseline level, but that the differences in scores between Q3 and Q2, and

Q3 and Q1, were too small to be detected as significant by the tests. Alternatively, it may be that there is indeed no significant difference between Q2 and Q3 for this statement ($p = 0.040$ is quite large, and $z = 2.057$ is relatively low), but that the difference between Q1 and Q3 *is* real, though not judged so because the adjustment reduces the power of the test (i.e. makes it more likely that a significant difference is declared insignificant). Statistical tests can never tell us with certainty what the truth of the matter is, and unfortunately there is always a trade-off between error and power (i.e. between avoiding false positives and false negatives). What the results do clearly show is that people came out of the film less likely to agree that they do as much as they can to mitigate climate change. In other words, the film did encourage people to consider that there might be more they could do.

Chapter 5: Investigating the long-term impacts of climate change communications on individuals' attitudes and behaviour [Paper 2]

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Abstract

To assess the effectiveness of climate change communications, it is important to examine their long-term impacts on individuals' attitudes and behaviour. This article offers an example study and a discussion of the challenges of conducting long-term investigations of behavioural change related to climate change communications (a vital and under-researched area). The research reported is a longitudinal panel study of the impacts on UK viewers of the climate change movie *The Age of Stupid*. The heightened levels of concern, motivation to act, and sense of agency about action that were initially generated by the movie did not measurably persist over the long term. The results also show that behavioural intentions do not necessarily translate into action. Data analysis raised issues concerning the reliability of participants' causal attributions of their behaviour. This and other methodological challenges are discussed, and some ways of avoiding or lessening problems are suggested.

Keywords

Climate change communications; Pro-environmental behaviour; Behavioural change; Behavioural intentions; Public attitudes

In recent years, governments, non-governmental organisations, and individuals have all been involved in creating 'climate change communications' aimed at changing public attitudes and behaviour related to climate change. These include leaflets and flyers; billboard, press, and television advertisements; short videos and full-length movies; and books of many kinds. Many environmental campaigns appear to be based on the presumption that people simply need more information in order to behave pro-environmentally. Such campaigns and the 'information-deficit' model they are based on have been widely criticised as inadequate to promote behaviour change (e.g. Blake, 1999; Kellstedt et al., 2008; Ockwell et al., 2009). Organisations such as Futerra (2005) and the Institute for Public Policy Research (Ereaut and Segnit, 2006), and academics such as Kloeckner (2011), Pooley and O'Connor (2000) and Moser (2007) advise that environmental messages should appeal to the emotions rather than simply providing factual information, to be more engaging. Climate change communications frequently use disaster framing to create a fear appeal intended to motivate mitigation action. One example is the movie *The Age of Stupid*.

5.1 Background and study rationale

5.1.1 Disaster framing, fear appeals, and individual agency

Current climate change discourses are often characterised by fear and catastrophe narratives (Doulton and Brown, 2009; Hulme, 2008). Shanahan (2007) argues that catastrophe framing of climate change stories is disempowering. This is important, if true, as a key determinant of action is agency, or efficacy (Bandura, 1977a; Grothmann and Patt, 2005). Agency includes not only the perception that one can act effectively but also that it is worth doing so, as individuals are reluctant to take action if they believe that it will make no difference (Hinchcliffe, 1996; Moisander, 2007). Protection Motivation Theory (Rogers, 1975) suggests that we change our behaviour in response to fear appeals only when we believe specific behaviours will reduce the threat.

Much of the literature suggests that fear appeals do change attitudes (Meijnders et al., 2001a, b), and promote desirable behavioural intentions (Roser and Thompson,

1995; Sherer and Rogers, 1984). However, O'Neill and Nicholson-Cole (2009) found that fear-based climate change representations do not motivate personal engagement with the issue, while Spence and Pidgeon (2010) found that positive framing produced attitudes towards climate change mitigation that were significantly more positive than those produced by loss frames, and Morton et al. (2011) found that positive framing combined with higher uncertainty about outcomes increased individuals' intentions to mitigate climate change, compared with negative framing. Results of studies that investigate actual behaviour in response to fear appeals are mixed (e.g. compare Hine and Gifford, 1991, with Leventhal et al., 1965). Fear appeals need to be combined with high-efficacy messages (useful information about how to avoid the threat) in order not to trigger maladaptive defensive responses (Lewis et al., 2010; Moser, 2007; Witte and Allen, 2000). Furthermore, Hastings et al. (2004) assert that there are few field research evaluations of fear appeals, and that laboratory studies of their efficacy are flawed by the over-use of student samples, forced exposure to communications under unrealistic conditions, and short-term measurement of impacts. 'Real world' situations, such as this study utilised, might produce different effects: Trumbo & Shanahan (2000), for example, found that increased public concern about climate change in response to dramatic media coverage fades once the coverage lapses.

5.1.2 Behaviour: psychological models and contextual factors

Arguably, attempts to change behaviour using fear appeals are closely related to Schwartz's (1977) Norm Activation Model, which posits that pro-social behaviour is driven by personal norms that depend on an awareness of the consequences of behaviour and ascription of responsibility for those consequences. The aim of many climate change communications appears to be to make the consequences of energy use vividly and frighteningly salient to the intended audience, and to promote the idea that mitigating these consequences is the responsibility of individuals. However, this model is a simplistic view of the factors influencing behaviour; more recent models are increasingly complex, including many more motivators of, and barriers to, behavioural change.

The influential Theory of Planned Behaviour (Ajzen, 1991) suggests that behaviour is mediated by behavioural intentions, which are the product not only of attitudes but also of social norms (see Schultz et al., 2007) and perceived behavioural control (PBC; one aspect of agency), and that PBC has a direct influence on behaviour insofar as it reflects actual behavioural control. In other words, contextual factors matter. This insight is reflected in the Attitudes-Behaviour-Context (ABC) model (Guagnano et al., 1995), which states that behaviour is influenced by external conditions (such as the provision of recycling bins) as well as attitudes. The Needs-Opportunities-Ability model of consumer behaviour (Gatersleben and Vlek, 1998) also stresses the importance of factors such as the availability of environmentally-friendly products, as well as financial, temporal, cognitive, and physical abilities. Stern (2000) suggests that an explanation of pro-environmental behaviour should include the ABC model plus recognition of the influence of personal capabilities and also habit/routine.

Shove (2010), however, critiques psychological models that view 'context' as an external driver of behaviour, asserting that "conventions that are often taken to constitute the context of behaviour have no separate existence" from the practices that reproduce the meanings and know-how associated with such behaviour, and therefore that "the driver and the driven are as one" (Shove, 2010, p. 1279). Thus, addressing consumers as isolated actors is not an effective behaviour change strategy; there is a need to change the meanings and materials associated with social practices, at a societal, rather than individual, level (Hand et al., 2005).

5.1.3 Investigating the impacts of climate change communications

Given these competing theories of behaviour and how to stimulate behavioural change, it is important to investigate the impacts of climate change communications on their audiences so as to know whether they achieve their aims, in order that limited resources may be used effectively.

Some work has already been done in this area. For example, O'Neill and Hulme (2009) studied the use of iconic images to engage the public with climate change impacts; Beattie et al. (2011) explored responses to clips of Al Gore's movie *An Inconvenient Truth*; and Reusswig et al. (2004), Balmford et al. (2004), and

Leiserowitz (2004) investigated the impact of *The Day After Tomorrow*, a fictional climate change-themed movie. These studies looked at the impact of the communication on respondents' attitudes and beliefs, and, in the case of the two latter studies, behavioural intentions. Given the well-documented 'attitude-behaviour' or 'value-action' gap (Anable et al., 2006; Blake, 1999), and research that shows that pro-environmental behavioural intentions do not necessarily correlate with behaviour (Bamberg and Möser, 2007; Barr, 2006), it seems clear that if we wish to understand the impact of climate change communications on behaviour, we must study individuals' behaviour. In some cases, this has been done: for example, Nolan (2010), studying the impact of *An Inconvenient Truth*, asked about behavioural intentions and then checked self-reported behaviour one month later. A study of the effects of *The Day After Tomorrow* by Lowe et al. (2006) asked viewers about motivation to act immediately before and after the movie, and then conducted focus group discussions a month later that included discussion about action. My initial study of the impacts of *The Age of Stupid* (Howell, 2011) included a follow-up survey 10–14 weeks after the movie, asking about behavioural change as a result of viewing it, and barriers to desired further change.

There are questions, however, regarding longevity of change: impacts may not persist (Abrahamse et al., 2005). For this reason, Steg and Vlek (2009), in setting out an agenda for research into encouraging pro-environmental behaviour, emphasise the need for long-term research. I therefore conducted a further follow-up survey of the impacts of *The Age of Stupid*, a year after my initial research, which is the focus of this article. Research attempting to assess behavioural change is challenging (and less common than studies focusing only on attitudes and intentions), and in the course of analysing results from this longitudinal study of attitudes and behaviour, issues regarding the reliability of the data that can be obtained were identified. The article therefore also highlights and discusses these problems, and potential solutions.

5.1.4 The Age of Stupid

Made with the stated intention "to turn 250 million viewers into climate activists" (AoS, undated), *The Age of Stupid* is a feature-length movie utilising both documentary and fictional elements to raise awareness of the problem of climate

change and its potential impacts. Set in 2055 in a world devastated by climate change, Pete Postlethwaite plays an elderly man living alone in a vast archive, watching news and documentary footage from 2008. This allows an exploration of some of the many contributory factors leading to disaster, through the eyes of a (disheartened) survivor asking, "Why didn't we save ourselves when we had the chance?" Viewers are not directly urged, or told how, to change their behaviour, but two of the documentary strands feature people engaged in exemplar actions: calculating their carbon footprint, deciding not to fly on holiday, travelling to France by train, growing vegetables, attending protests, and explaining other ways they have tried to reduce their greenhouse gas emissions. Two policy proposals, contraction and convergence and personal carbon allowances, are also briefly explained. It is an interesting climate change communication to study for various reasons.

First, it had the potential to be influential and to be seen by a wide audience: the movie garnered a lot of media attention ahead of its release in the UK in March 2009, and the director, Franny Armstrong, spoke at several events alongside then-Secretary of State for Energy and Climate Change Ed Miliband. Worldwide release was planned, and achieved in September 2009, and the filmmakers retained distribution rights so that the movie can easily and legally be publicly screened by anyone who pays a licence fee to do so. During the first six months after release, more than 1,200 such screenings were organised, and the filmmakers claim that the global premiere was watched by a million people in 63 countries (AoS, undated). Later, the movie was shown on television in the UK, Belgium, Finland, the Netherlands, and Norway during the UN climate conference in Copenhagen in December 2009.

Second, the combination of documentary strands with a fictional dystopian-future frame was unique, distinguishing it from the more usual approaches of previous climate change movies such as *The Day After Tomorrow* (a Hollywood disaster movie) and *An Inconvenient Truth* (a traditional-style documentary), and other types of communications such as campaign advertisements and leaflets, which tend to be factual.

Moreover, unlike many climate change communications, *The Age of Stupid* does not focus on climate science, but instead presents interweaving stories of seven

people in different countries to examine inter-related issues of fossil fuel dependency, pollution, extreme weather, and conflict, as well as climate change impacts such as receding Alpine glaciers. Its appeal is to the emotions, and the movie arguably attempts to use fear and guilt as motivators, presenting several 'disaster narratives' both fictional and factual – for example, the world devastated by climate change, and images of Hurricane Katrina, oil pollution in Nigeria, and Iraq war refugees.

Finally, although the movie depicts some characters engaging in mitigation behaviours, arguably it does not focus enough (or directly enough) on providing solution messages and inculcating a sense of agency in viewers, as recommended by Protection Motivation Theory.

Thus, *The Age of Stupid* offers an opportunity to explore whether catastrophe framing is an effective communications approach to inspire change, or a disempowering one.

5.1.5 Study aims

The hypothesis was that the movie would raise concern, but that this effect would fade away by the time of the follow-up questionnaires. The study was also designed to assess changes in participants' *fear* of 'climate catastrophe', *motivation* to act, sense of *agency* in relation to climate change action, and self-reported *knowledge* about mitigation actions. No hypotheses were made at the outset about how these attitudes and beliefs might change because it seemed doubtful to conjecture whether *The Age of Stupid* would be experienced as inspiring, motivating, and informative, or whether the 'doom and gloom' presentation and lack of direct, specific suggestions for action in the movie would tend to increase fear to a level that would overwhelm feelings of motivation and agency, leaving the audience despairing that personal action is worth taking. Similarly, the study aimed to explore whether the audience took any action as a result of seeing the movie without testing any particular hypotheses about this, as the literature was not conclusive about whether a communication framed in this way would result in actual behavioural changes.

5.2 Method

5.2.1 Participants and procedure

The research involved a panel study with participants recruited randomly from among viewers at the Edinburgh Filmhouse during the period 20–24 March 2009. It comprised four surveys: one immediately before seeing the movie (Q1), one immediately afterwards (Q2), a follow-up sent out 10 weeks later (Q3), and a final follow-up in June 2010 (Q4). This 'pre/post-test' design has been utilised in similar research (Lowe et al., 2006; O'Neill and Hulme, 2009; Reusswig et al., 2004) and was extended in this study by the inclusion of the two follow-up questionnaires. Each respondent's questionnaires were identified by a unique number so that responses could be matched across the longitudinal study. The procedure and survey instruments used for the first three questionnaires are described in more detail in Howell (2011).

The initial surveys (Q1 and Q2) were completed by 241 respondents, of whom 213 agreed to participate in a follow-up. Q3 was completed by 162 people (67.2% of the initial sample); 136 of these agreed to participate in a further follow-up. They were emailed a link to the online final questionnaire and were offered as an incentive to complete it a chance to win one of three £10 vouchers for a store/service of their choice. Two reminders were sent and paper copies were mailed to a few participants who gave only a postal address. Altogether, 105 people completed the final survey, but one questionnaire could not be matched up so had to be discarded, giving a sample for Q4 of 104 respondents (43.2% of the original sample).

5.2.2 Questionnaires

All four questionnaires contained identically-worded questions about attitudes and beliefs related to climate change, so that these could be compared across the period of the research. In addition, each questionnaire included questions unique to that time point of the study. On all four questionnaires the term *climate change/ global warming* was used because research by Whitmarsh (2009b) has shown that the terms *climate change* and *global warming* are not entirely synonymous to the

general public, and it was important to avoid the study results being affected by the choice of one term over the other.

People often report high levels of concern about environmental issues in isolation, but actually feel more worried about other problems (Defra, 2009; Downing and Ballantyne, 2007; Lorenzoni and Pidgeon, 2006). Thus, on all four questionnaires, respondents were asked an identical question about their level of concern about climate change alongside a variety of other global issues (AIDS, species extinctions, 'credit crunch'/recession, poverty, terrorism) so as to determine the relative level. Concern was measured on a 5-point scale from *not at all concerned* to *very concerned* for each issue.

Respondents were also asked on each questionnaire to indicate their agreement on a 7-point scale from *strongly disagree* to *strongly agree* with statements about motivation to act, knowledge of how to cut their carbon footprint, sense of agency, and fear about catastrophic climate change.

On Q3 and Q4, participants were asked multiple-choice questions about whether they had taken, or were engaged in, a number of specific actions. Apart from "awareness-raising", these behaviours were chosen to represent a variety of possibilities in the areas that have highest environmental impacts (home energy, travel, and food; Tukker, et al., 2006, reported in Peattie and Peattie, 2009), ranging from easier actions to those that are likely to be more difficult, expensive, or time-consuming. Most relate to the 'headline behaviour goals' outlined by the Department for Environment, Food and Rural Affairs (Defra) for government behaviour change campaigns to focus on (Defra, 2008a). To avoid suggesting an expectation that respondents should be engaged in such behaviours, it was stressed that "Not all will necessarily be possible for you, or you may not want to do them." Questions about behaviour were not included on Q1 or Q2 because I was concerned that if these questionnaires were too long or complex, participants would not be willing to complete them during a visit to the cinema. The exclusion of such questions also avoided giving participants ideas about what they could do, and what I might ask about on follow-up questionnaires, protecting Q3 results from one element of distortion. The focus of the research was instead on respondents' self-attributed behaviour in response to the movie, captured during the later surveys.

One of the themes of *The Age of Stupid* is the high greenhouse gas emissions associated with flying – a character in the movie says that "other than setting fire to a forest, flying is the single worst thing an ordinary individual can do to cause climate change." The issue is also discussed when a couple decide not to fly on holiday, and there is implicit criticism in the documentary strand about an Indian entrepreneur starting a budget airline. Because of this emphasis, respondents were asked on Q3 about their intentions regarding taking holidays involving flying ("this year" and "long term"); on Q4, in addition to a repeat of the item about long-term intentions, questions about actual and planned holiday flying during 2009 and 2010 were included to ascertain whether the earlier behavioural intentions were carried through.

Socio-demographic data, reasons for seeing the movie, and pre-viewing donations to/involvement with climate change campaign groups were captured on Q1.

5.2.3 Analysis

As the data collected on attitudes and beliefs were ordinal-level data, and were not normally distributed but tended to reveal opinions skewed towards one or the other end of the scales used, nonparametric tests of significance were employed for data analysis. The Friedman test (a nonparametric version of analysis of variance) was used to determine whether there were overall differences between all the questionnaires in respondents' attitudes. Where significant differences were found, this justified using the Wilcoxon signed ranks test to examine the significance of differences between pairs of questionnaires separately.

5.3 Results

The results of the first three questionnaires have been published and discussed elsewhere (Howell, 2011); this article focuses on the results of the final survey, how they compare with the previous results, and what we can learn from this about longitudinal studies of this kind. Other than where specified, only results for the 104 people who completed all four surveys are included – and thus some statistics are

slightly different from those presented in Howell (2011), which reported results for the larger samples that completed the first questionnaires.

5.3.1 Characteristics of survey respondents

Table 11: Socio-demographic characteristics of respondents

	% of responses		
	Q1 and Q2 (n = 241)	Q3 (n = 162)	Q4 (n = 104)
Gender			
Female	56.0	56.2	57.7
Male	38.6	40.1	38.5
Not given	5.4	3.7	3.8
Age			
16–24	13.3	13.0	13.5
25–34	23.2	24.7	23.1
35–44	17.0	19.1	21.2
45–54	14.9	13.0	12.5
55–64	16.2	16.0	18.3
65+	13.3	13.0	9.6
Not given	2.1	1.2	1.9
Education			
First degree/masters	68.5	68.5	67.3
PhD	10.0	9.9	9.6
Lower qualifications	15.3	14.8	15.4
Not given	6.2	6.8	7.7
Occupation			
Managerial/professional[a]	49.0	50.0	53.9
Retired	17.4	17.3	14.4
Student	13.3	14.2	14.4
Intermediate occupations[a]	10.8	9.2	8.6
Routine/manual occupations[a]	2.5	3.1	3.8
Unemployed	1.2	1.2	0
Homemaker	0.4	0	0
Not given	5.4	4.9	4.8

[a] Occupations given were allocated to these classes as accurately as possible according to the National Statistics Socio-economic Classification (NS-SEC). Where it was not possible to determine the skill level of jobs which might be classed as either managerial/professional or intermediate, they were classed as managerial/professional, and thus this category might be inflated.

There were no major differences between the initial and follow-up samples with regard to socio-demographic characteristics (see Table 11, above). Throughout the study there was a bias towards women, and respondents were more highly educated and more likely to be employed in managerial/professional occupations than the Edinburgh population in the 2001 census. The proportion of respondents in

the 35–44 category increased, while the proportion in the 65+ category decreased between the first questionnaires and the final follow-up. Unsurprisingly, therefore, a slightly higher proportion of the final sample was engaged in managerial/ professional occupations, and fewer were retired, than was the case for the initial sample.

However, there *were* important differences between the samples in other respects: it is evident from Figure 14 (below) that those who stayed in the longitudinal study were somewhat more likely than those who dropped out to have agreed on the initial questionnaire with statements demonstrating high levels of interest, concern, motivation, and engagement with climate change groups.

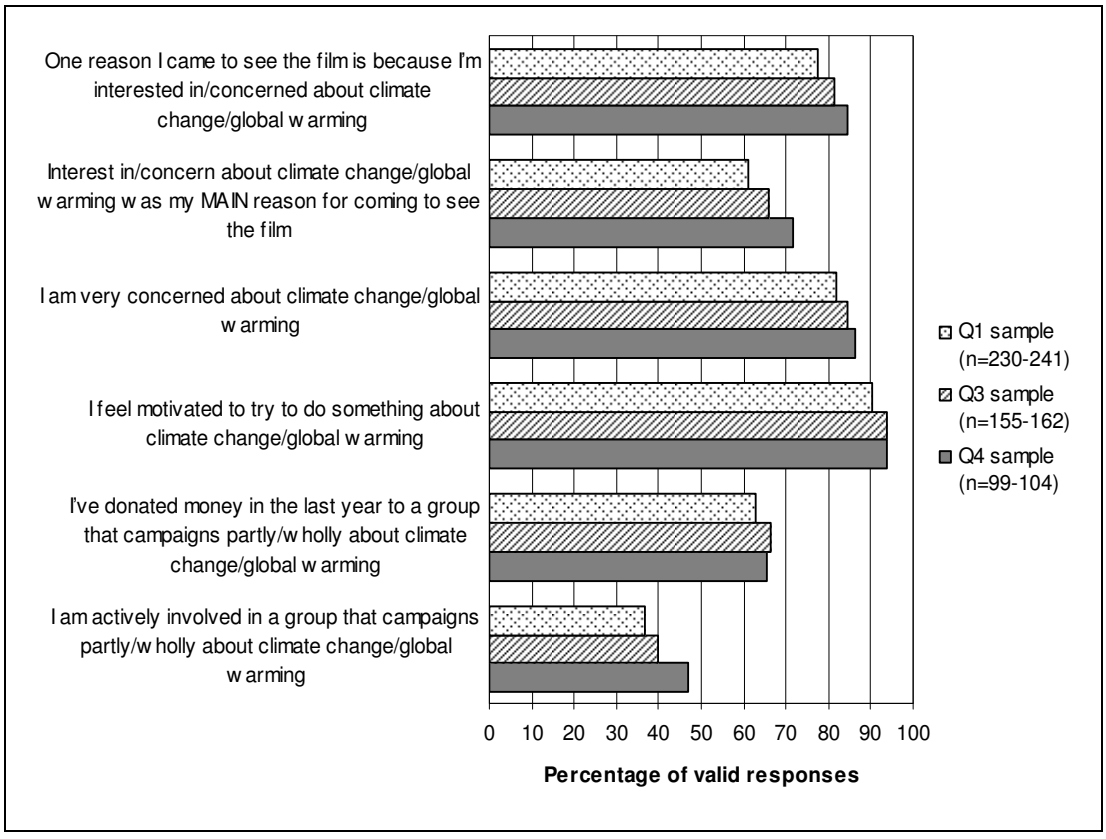

Figure 14: Percentage of respondents in each sample who agreed *on the first questionnaire* with these statements

5.3.2 Changes in attitudes

Before seeing the movie, 86.5% of respondents reported being "very concerned" about climate change, and 12.5% "somewhat concerned" (Howell, 2011),

and the proportion of respondents in those categories was higher for climate change than for any other issue on every questionnaire. Analysis of the first three questionnaires showed that any heightened concern about climate change felt immediately after the movie was a temporary effect (Howell, 2011). Apparent differences in the level of concern between Q4 and other questionnaires were not statistically significant (considering the tests as part of a single family with those reported in Table 12 and applying a Holm's (1979) sequentially rejective Bonferroni adjustment for multiple testing). However, the results for the hypothesis that concern on Q4 was lower than immediately after seeing the movie approached significance ($z = 2.558$, $p = 0.006$ compared with adjusted $p = 0.005$). Fewer participants reported feeling "very" concerned about climate change on Q4 than Q2 (78.8% compared with 89.3%), whereas more described themselves as "somewhat" concerned (17.3% compared with 9.7%). Out of 104 respondents, 16 (15.4%) revised their concern level downwards (by 20 points in total) from Q2 to Q4, whereas 5 (4.8%) revised upwards by one point each.

Agreement with statements about motivation, knowledge, fear, and agency is shown in Table 12 (p. 142). Results of the Friedman test justified further analysis of changes in responses to statements 1, 2, 5, and 6; there were no significant differences in opinions between the four questionnaires for the other statements. Previous results showed that immediately after seeing the movie, respondents exhibited increased motivation to act and belief that they could do something, and decreased agreement with the statement "I do as much as I can about climate change/ global warming"; these impacts had faded by the time of the first follow-up (Howell, 2011).

At the time of the final follow-up, motivation to act and agreement that "I can do something" were again significantly lower than immediately after seeing the movie, but not than the baseline or Q3. Agreement that "I do as much as I can" was significantly higher than immediately after seeing the movie but not than the baseline or Q3. Belief that "It's worth lobbying politicians about climate change/global warming" was lower on Q4 than both Q2 and the baseline (see Table 12 for the test statistics associated with these results).

Table 12: Changes in respondents' motivation, knowledge, fear and agency

	% of valid responses agreeing (n = 100–104)				Comparison to Q4 (Wilcoxon test statistic z)		
Statement	Q1	Q2	Q3	Q4	Q1	Q2	Q3
(1) I feel motivated to try to do something about climate change/global warming	94.0	95.1	92.3	90.4	n.s	–3.507	n.s
(2) I can do something to prevent climate change/global warming getting worse	89.2	94.1	88.4	86.5	n.s	–4.323	n.s
(3) I know what I can do to reduce my carbon emissions	95.0	93.2	94.2	93.3	n.s	n.s	n.s
(4) Cutting my carbon emissions won't make a difference to the problem of climate change/global warming	19.8	22.5	18.2	18.3	n.s	n.s	n.s
(5) It's worth lobbying politicians about climate change/global warming	89.1	88.3	83.7	79.9	–3.551	–2.971	n.s
(6) I do as much as I can about climate change/global warming	66.0	52.0	60.2	64.5	n.s	2.782	n.s
(7) I fear humanity will not do enough to prevent catastrophic climate change/global warming	85.2	87.1	89.5	88.4	n.s	n.s	n.s

Note: n.s = no significant difference; all other results significant at $p \leq 0.005$. Holm's (1979) sequentially rejective Bonferroni method was used to adjust for multiple testing and control the familywise error rate at $\alpha = 0.05$. A negative z value indicates that agreement on Q4 was lower than on other questionnaires.

5.3.3 Behavioural changes

Table 13 (below) shows participants' self-reported behaviour. The percentage of respondents who said that they were trying to raise awareness of climate change noticeably decreased between Q3 and Q4, but other changes were small. To test the statistical significance of the differences, an 'action score' was constructed for each participant who completed both Q3 and Q4, for each of these two questionnaires, by awarding 1 point for each action taken. Action scores for Q3 ranged from 3 to the maximum of 13, with a mean of 8.46 (SD 1.97), and for Q4 from 2 to 12, with a mean of 8.53 (SD 1.80). A paired samples *t*-test showed no significant difference between the scores for Q3 and Q4.

Table 13: Percentage of final sample who reported taking specific actions (*n* = 102–104)

	on Q3[a] %	on Q4[b] %	Net difference in no. of respondents
Trying to raise awareness among people I know	89.4	77.7	–13
Home energy use			
Turned down heating/cut time heating on	97.1	89.4	–7
Washing clothes at 30°C (usually/always)	72.8	76.0	+4
Drying clothes on rack or line (usually/always)	93.2	89.4	–3
Changed to 'green electricity' supplier/tariff	41.2	38.2	–3
Generating energy through home renewables	5.9	5.8	0
Travel			
Cut down/avoid driving	93.3	91.4	–2
Car sharing/car club (leave blank if never drive)[c]	33.8	27.5	–7
Planning to reduce/stop holiday flying long term	67.0	66.1	–1
Food			
Avoiding buying bottled water	88.5	87.4	–2
Buying more local produce	88.5	89.4	+1
Reduced meat consumption/eat vegetarian/vegan	76.0	75.7	–1
Composting food waste	51.5	53.0	+1

[a] Respondents who answered either "I have done this/am doing it more, because of seeing the film" or "I have done/am doing this, but not because of seeing the film".
[b] Respondents who answered either "I started or increased doing this because of the film and I've continued" or "I am doing this, but not because of seeing the film".
[c] For this statement, *n* = 77 on Q3 and *n* = 69 on Q4 because of the instruction to leave the line blank if the respondent never drives.

Table 14 (p. 144) shows respondents' causal attributions for their behaviour. Respondents were most likely to state "I am doing this, but not because of seeing the

Table 14: Differences between Q3 sample (*n* = 160–162) and Q4 sample (*n* = 102–104) in self-attributions of causes of their behaviour

	I am not doing this		I started doing this (more) due to film but this didn't last	I am doing this (more) due to film		I am doing this, but not due to film	
	Q3	Q4	Q4	Q3	Q4	Q3	Q4
Trying to raise awareness among people I know	14.2	14.6	7.8	27.8	20.4	**58.0**	**57.3**
Home energy use							
Turned down heating/cut time heating on	3.7	9.6	1.0	9.3	15.4	**87.0**	**74.0**
Washing clothes at 30°C (usually/always)	26.9	23.1	1.0	10.0	15.4	**63.1**	**60.6**
Drying clothes on rack or line (usually/always)	6.2	9.6	1.0	3.1	1.9	**90.7**	**87.5**
Changed to 'green electricity' supplier/tariff	**64.4**	**61.8**	0	4.4	12.7	31.3	25.5
Generating energy through home renewables	**93.2**	**94.2**	0	1.2	1.0	5.6	4.8
Travel							
Cut down/avoid driving	6.8	6.7	1.9	11.7	13.5	**81.5**	**77.9**
Car sharing/car club (leave blank if never drive)[a]	**66.9**	**72.5**	0	0.8	5.8	32.2	21.7
Planning to reduce/stop holiday flying long term	**40.6**	31.1	2.9	21.9	21.4	37.5	**44.7**
Food							
Avoiding buying bottled water	14.2	11.7	1.0	15.4	19.4	**70.4**	**68.0**
Buying more local produce	12.3	8.7	1.9	17.9	19.2	**69.8**	**70.2**
Reduced meat consumption/eat vegetarian/vegan	27.8	22.3	1.9	8.6	12.6	**63.6**	**63.1**
Composting food waste	**49.1**	**47.1**	0	2.5	6.9	48.4	46.1

Note: Figures are percentages of valid responses and the most common response to each statement on each questionnaire is highlighted in bold.
[a] For this statement, *n* = 118 on Q3 and *n* = 69 on Q4 because of the instruction to leave the line blank if the respondent never drives.

film" with regard to the easier/less costly behaviours, and "I am not currently doing this/can't do this" about the more difficult/expensive options. There were, however, some participants who reported "I started or increased doing this because of the film and I've continued" for every action.

The proportion of respondents who attributed action to the influence of the movie was higher on Q4 than Q3 for most actions. If participants' responses are taken at face value, this could indicate that either (a) the final follow-up was completed only by those most likely to have changed their behaviour, or (b) it took some participants a while to begin taking action as a result of seeing the movie. Alternatively, this finding may provide evidence that respondents' causal attributions of their behaviour are unreliable. Further examination of the data showed (a) to be untrue, and that although there were a few 'late starters' (people who stated that they started or increased action as a result of the movie, but not until *after* the first follow-up) for most actions (see Table 15, p. 146), they did not fully account for the increase in the proportion of respondents attributing behavioural changes to the effect of seeing the movie. There were so few of them in each case that this could be 'noise' rather than a genuine effect.

Instead, in all cases there was a considerable proportion of people who said on Q3 that they were doing the action but not because of the movie, but on Q4 stated that they started/increased doing it because of the movie and have continued (see Table 15). This only makes sense if they were already taking action before seeing the movie but started doing more because of it, though not until after the first follow-up. It is questionable whether this is really true, especially for such a high proportion of respondents (50% or more of those who attributed action to the effect of seeing the movie for many of the behaviours): it seems unlikely, for example, that those already drying their clothes on a rack, or composting, would do these things more because of seeing the movie, but not until at least two or three months after seeing it. This suggests that participants attributed action to the impact of the movie in retrospect that in fact they were already taking. It is also possible that for some respondents, completion of Q3 acted as a prompt to take (more) action. In either case, it is

doubtful whether one could draw reliable conclusions about the impact of the movie on behaviour from these data.

Table 15: Results of comparisons between Q3 and Q4 of causal self-attributions for behaviour

	Number of respondents who attributed action to the film on Q4		
	Total	Who said on Q3 they were not taking this action: 'late starters'	Who on Q3 attributed action to something other than the film
Trying to raise awareness among people I know	21	1	8
Home energy use			
Turned down heating/cut time heating on	16	0	12
Washing clothes at 30°C (usually/always)	16	4	4
Drying clothes on rack or line (usually/always)	2	0	2
Changed to 'green electricity' supplier/tariff	13	4	6
Generating energy through home renewables	1	0	1
Travel			
Cut down/avoid driving	14	1	9
Car sharing/car club (leave blank if never drive)	4	0	2
Planning to reduce/stop holiday flying long term	22	2	6
Food			
Avoiding buying bottled water	20	1	10
Buying more local produce	20	1	7
Reduced meat consumption/eat vegetarian/vegan	13	3	4
Composting food waste	7	3	4

5.3.4 Comparing behavioural intentions and action

To examine whether participants' behavioural intentions were reflected in later behaviour, expected counts assuming no correlation between intention and action were calculated for flying behaviour, based on the proportion of the sample who gave each one of three possible answers to the questions on Q3 about intentions regarding holiday flying. If intentions translate into action, the responses on Q4 to the questions about flights actually taken should be significantly different to these expected counts.

Twenty people who completed Q4 had stated on Q3 that they were planning to take holidays without flying during 2009 because of seeing the movie; of these, 9 did fly on holiday, and 11 did not. These figures are very similar to the expected counts assuming no correlation between intention and action: 10 people to take a flight and 10 not to do so. (The calculated expected counts just happen to work out as a 50/50

split in this case; this was not assumed.) Out of 22 Q4 respondents who had said on Q3 that they had decided to reduce/cut out holiday flying *long term* because of seeing the movie, 12 said they would not be taking a holiday flight in 2010, compared with the 10 expected assuming no correlation between intention and action, 7 said they had/would (one less than expected), and 3 said they "possibly" or "probably" would (again, one less than expected). Of course, taking a holiday flight during 2010 does not necessarily mean that a person has given up a decision to "cut down" on holiday flying, but neither do these results give a very clear indication that participants are acting on their intentions.

However, respondents who intended to holiday without flying for reasons other than seeing the movie were more likely to carry out their intentions. There is a significant correlation in the data (Cramér's $V = 0.461$, $p < 0.001$) between respondents who said on Q3 that they would not be flying that year "but not because of the film" and those who reported on Q4 that they had not flown in 2009. Those who stated on Q3 that they had decided to reduce/cut out holiday flying *long term* "but not because of the film" were also more likely ($V = 0.268$, $p = 0.005$) to report on Q4 that they would not be taking a holiday flight during 2010 (57.4%, compared with 17.6% who had not decided to cut holiday flying).

5.4 Discussion

5.4.1 Long-term impacts of The Age of Stupid

The hypothesis tested by this study is that although a movie of this kind is likely to make climate change more immediately salient and bring related fears to the forefront of viewers' minds, any heightened level of concern felt straight after seeing the movie would not persist long term. There is some evidence to suggest that this was the case, although the differences in levels of concern between this final follow-up and the other questionnaires were not statistically significant. It may be that the tests did not have enough power to detect significance, given the sample size and number of comparisons performed, or that the response scale was not sensitive enough and should have been extended at the top (e.g. *extremely*; *very*; *quite a lot*; *somewhat*, rather than just *very* and *somewhat*), to differentiate between different but

high levels of concern. Alternatively, since those who remained in the survey to the end were most likely to demonstrate the highest concern to begin with, the lack of significant changes might simply reflect that the movie had very little measurable effect on concern among these self-selected moviegoers. It may indicate that many respondents had already reached the highest level of ongoing concern that they could sustain while continuing their everyday lives.

This does not mean that a movie like this cannot contribute to raising awareness and long-term concern about climate change; it may be that it would have a clearer long-term impact on viewers who were less engaged with the subject before seeing the movie, especially as it might add to a general build-up of concern arising from many different sources, or pave the way for another communication or event to have more of an impact. Marketing research shows that exposure to several linked advertisements over time increases recall and can contribute to desired attitudes (Vakratsas and Ambler, 1999; Zielske, 1959).

The 'disaster framing' of the movie did not, in general, leave the audience sampled feeling disempowered or inclined to maladaptive defensive responses; possible explanations for this, based on the self-selecting and unrepresentative nature of this audience, are discussed in Howell (2011). No hypotheses were made about how participants' attitudes and beliefs might have changed between Q3 and the final follow-up, because although it seemed likely that the heightened motivation to act and sense of agency engendered by the movie would not persist directly because of it, it did seem possible that if respondents had started taking action as a result of the movie, that might impact on their attitudes. The finding that where there had been a change immediately after seeing the movie, agreement with most of the statements presented in Table 12 (p. 142) reverted to the baseline level by the time of Q4 (except for belief in the worth of lobbying politicians, which was lower than the baseline by Q4), suggests that this was not especially the case, but again, this may be because participants in the study were already so engaged with the issue from the outset that their attitudes were developed and stable. A control group with which to compare long-term attitudinal changes would be useful, but in this non-laboratory situation it would have been difficult to recruit a sample with the same characteristics as the moviegoers (which were not known until after analysis of the initial

questionnaire), who would commit not to watch the movie for 15 months. As there appear to be no long-term attitudinal impacts of the movie, the lack of a control group means that the most likely risk of error is that the longitudinal impacts are underestimated, in that it is possible that had participants not seen the movie, their concern, motivation, and sense of agency might have fallen below the baseline over 15 months.

As regards behavioural changes that respondents attributed to seeing the movie, responses to the final follow-up questionnaire suggest that, by and large, participants persisted with changes they had made. There was also possibly some evidence of a 'late starter' effect – that it took time for some people to begin taking action as a result of seeing the movie, so the changes they made were not captured by the first follow-up questionnaire. For certain actions, these late starters made up a significant proportion of the total who claimed to have started or increased doing the action because of the movie (see Table 15, p. 146); in the case of switching to a 'green electricity' tariff or supplier, adopting a reduced meat diet, and setting up a composting system, it is certainly not surprising that it might take some time to make these changes. If responses are taken at face value, the study therefore suggests that the movie might have had a greater effect than was initially apparent, but this is not a robust conclusion given the small numbers of respondents concerned. On the other hand, the questions about flying revealed that actual behaviour was much more likely to be correlated with an intention not to fly for a reason other than seeing the film (perhaps an existing pro-environmental commitment, or because of financial constraints) than with a resolve made after watching the movie. This should not surprise us: research has shown that energy conservation is often undertaken for reasons other than (or in addition to) concern about climate change (Whitmarsh, 2009a); moreover, the theories about behaviour discussed earlier suggest that, as behaviours are complex products of personal psychological features and contextual factors, it is likely that even many very engaged individuals need more than just the stimulus of watching a movie to give up a popular behaviour. The potential for greater or lesser impacts than are obvious from a short-term follow-up, as revealed by the analysis of Q4 compared with Q3, shows the importance of considering

impacts over a time-span of months to years, rather than just immediate changes or a period of a few weeks.

5.4.2 Implications for using movies to communicate about climate change

Because they are able to present complex information in an intelligible way, and to emotionally engage their audiences, movies have significant potential as a means of communicating about climate change. They allow viewers to feel that they are right there 'at the scene,' and (in documentaries at least) being addressed directly by the characters. However, behaviour change theory implies that movies like *The Age of Stupid* that focus mostly on raising awareness of the problem may be more likely to change attitudes than behaviour, and be better suited for audiences who are not already very engaged with the issue (Howell, in press). This study suggests that the audience attracted to watch a movie like *The Age of Stupid* does not fit that description. The inclusion of Al Gore's documentary *An Inconvenient Truth* in the school curriculum in several countries (Nolan, 2010) means that it may be reaching a more appropriate audience; research investigating the impacts on schoolchildren would be worth conducting.

If directors wish to promote behavioural change rather than raise awareness and increase (possibly only short term) concern, Protection Motivation Theory suggests that they should incorporate solution messages into their movies, including perhaps portraying more characters taking action, to model behaviours and make them more familiar to audiences. Furthermore, in order to capitalise on the heightened concern felt immediately after viewing, movies could be coupled with other interventions at the time of screening, such as public pledges, goal setting, and formulating behaviour implementation intentions. Although this study has shown that intentions do not always translate into action, encouraging people to make specific public pledges and plans can be effective (Bamberg, 2000; Cobern et al., 1995). The makers of *The Age of Stupid* tried to ensure that screenings during the opening week were accompanied by talks and information stalls provided by various organisations, to encourage viewers to get actively involved in local groups and campaigns. The movie also did offer viewers a sense of moral support and encouragement regarding what they were already doing (Howell, 2011), so

communications like this may have a role to play in reinforcing existing pro-environmental behaviour.

5.4.3 Problems with longitudinal studies of climate change communications impacts

The first issue this research exposes is that of the recruitment and retention of respondents who are not 'the converted' (as several put it). Participants who remained in this study seemed to be those most concerned about climate change at the outset, and the whole sample showed more concern about climate change compared with other issues than respondents in other studies (Defra, 2007, 2009; Norton and Leaman, 2004). This was despite the fact that incentives were offered at each stage of the survey for completion of the questionnaires. It is generally likely to be difficult to study the impact of climate change communications such as movies, talks, or workshops on the 'general public' by recruiting among those who attend them voluntarily, as such initiatives often 'preach to the converted' (Auldsmith, 2009). Other methods are necessary and sometimes used (see 5.4.4).

Second, the study raises the question of the reliability of causal self-attributions of behaviour. Problems have been identified with using self-report measures of behaviour (Chao and Lam, 2011; Corral-Verdugo, 1997; Manfredo and Shelby, 1988); respondents tend to over-estimate their pro-environmental or pro-social behaviour, perhaps because of a desire to offer socially desirable responses or because their self-identity as a 'green' or 'socially responsible' person leads them to assume that their behaviour correlates more with their values than it actually does. Requesting attributions of causes for that behaviour adds another layer of complexity. The Fundamental Attribution Error is well-established: observers tend to attribute others' behaviour to disposition, ignoring the influence of situational constraints (Jones and Harris, 1967); actors themselves are more likely to explain their behaviour in terms of the context in which they act (Nisbett, 1973; Storms, 1973). People like to justify effort that they expend (Aronson and Mills, 1959), which might lead respondents to attribute behaviour changes to the effects of a movie they had voluntarily seen (travelling a fair distance in some cases, for example, from St Andrews). Moreover, individuals underestimate the influence of social norms on their behaviour (Nolan et al., 2008). These studies, and the social practices literature

mentioned earlier, show that there are influences on behaviour that individuals are often unaware of.

To these problems this study adds the finding that, given a lapse of time, individuals sometimes offer causal attributions for their behaviour that contradict previous attributions. In this case, participants were more likely after fifteen months than at the time of the earlier follow-up to attribute their self-reported behaviour to the influence of the movie. Leaving aside the issue of unrecognised influences on behaviour, it is not surprising that over time people forget exactly what consciously prompted them to adopt certain actions; it may be that respondents who were sympathetic to the aims of the movie were over-inclined to attribute behaviour to its impact as their memory became faultier with temporal distance from the screening. Another possibility is that prior questions on Q4 about the influence of *The Age of Stupid* primed respondents to attribute actions to the impact of the movie when they were asked about these, more than questions on Q3 did, again because of the greater time lapse between Q4 and the screening creating more memory problems. Dijksterhuis et al.(2008) show how priming individuals using certain words alters attribution of authorship of subsequent events.

Related to this is the difficulty of isolating the impacts of one 'intervention' when there are so many other events or pieces of information that may influence behaviour. Newspaper coverage of climate change has significantly increased in recent years, for example (Boykoff, 2008; Doulton and Brown, 2009; Weingart et al., 2000).

Completion of the questionnaires themselves could have influenced respondents' attitudes or acted as a prompt for action, as hinted by one who commented that Q3 "was in itself thought-provoking." Although care was taken to frame questions in a neutral way, a questionnaire cannot avoid focusing attention on particular issues and ideas, and in this case, actions, that the participants might not otherwise have considered. Thus the collection of the data renders its reliability suspect when it comes to the attribution of impacts.

It is clear from the results concerning holiday flying that behavioural intentions cannot be assumed to be proxies for actual behaviour. These results do not show that intentions never translate into action; for example, respondents reported in the 'other

comments' section: "My biggest change has been not flying anymore. I have made two trips from Germany to Scotland without flying […] I will try to continue doing this", and "I now ration my air travel to one flight per year." However, intentions are often more pro-environmental than observed behaviour (Chao and Lam, 2011). What is interesting in this study is that intentions that existed independently of the movie did correlate well with behaviour. If emissions reductions motivated these intentions, rather than financial or other considerations, this result indicates that some pro-environmental intentions, perhaps those developed over a longer period of time, may predict behaviour well. Further long-term research would be needed to explore this possibility.

Finally, I offer a note on statistical analysis of studies of attitudes and behaviour. It is common to report the mean of questions that use a single-item Likert-type response format, and to use parametric tests such as the *t*-test to analyse this kind of data (e.g. Chib et al., 2009; Lowe et al., 2006; Pooley and O'Connor, 2000). However, these statistics were developed for interval-level data (Kurzon et al., 1996; Siegel and Castellan, 1988), but on a question of concern, for example, we cannot be sure that the difference between *somewhat* and *very* concerned is the same as the difference between *not at all* and *a little* concerned, or any two other response points. The comparison of means may therefore be problematic and there is controversy over whether parametric tests may be used with this type of data (e.g. Carifio and Perla, 2007; de Winter and Dodou, 2010; Knapp, 1990). Instead, one can use nonparametric tests, as in this analysis (although there is not a neat substitute for the mean of a response item, which is a very accessible way of giving an overall idea of the strength of opinions). Nonparametric tests can have greater power than parametric tests when distributions are skewed (as was the case for most items on the questionnaires reported here, where opinions tended to cluster at one end of the spectrum; de Winter and Dodou, 2010). One can also create a true 'Likert scale' involving several items to test attitudes (Carifio and Perla, 2007), although single items that are well-designed can be as valid as multi-item scales (Gardner et al., 1998). Alternatively, there may be some justification for designing questions in such a way that the response format approximates an interval scale, for example by using a visual analogue scale, a line on which participants are asked to place a cross to

indicate their response anywhere between the two anchor end-points (see, for example, Vickers, 1999, who discusses the advantages and disadvantages of this method compared with the use of ordinal response measures). Researchers would be well-advised to be aware of this debate and to pay careful attention to the design and analysis of questions so as to be able to justify their choice of parametric or nonparametric statistics.

5.4.4 Overcoming research problems

It is vital that we attempt to address problems with longitudinal studies of the impacts of climate change communications, because we need to know how these communications affect both attitudes and behaviour long term.

For some studies, the recruitment and retention of a representative sample does not matter; we might wish to study the impact of an intervention on those who voluntarily participate in it, and indeed to find out whether or not it *is* the general public who participate, and if not, in what ways the sample differs from the rest of the population. This was the approach taken with this study of the impact of *The Age of Stupid*. Otherwise, for communications not received by everyone (such as leaflets through mailboxes), one can recruit a sample and present the communication to them at a specially arranged presentation. Student samples are frequently used, as in the study on the impact of *The Day After Tomorrow* by Nolan (2010), but these are also not representative in terms of age, background, education, or income. A really robust study would recruit a representative random sample from the general population, but this takes time and is likely to require offering significant incentives for participation, especially for a longitudinal study.

To overcome the problems of relying on self-report behaviour, Steg and Vlek (2009) advise measuring actual behaviour where possible. Chao and Lam (2011) recommend using multi-report methods such as diaries, observed behaviour, and meter readings. They trained students to observe particular aspects of the behaviour of their roommates in university dormitory accommodation and compared these reports with self-reports of the observed subjects. This requires a living or workplace situation where subjects' behaviour can be readily observed – not so easy in a culture where sharing space with people other than one's own family is unusual past the

student years. If done without the consent of the subjects it could also raise ethical issues, but seeking consent could then lead to socially desirable behaviour from subjects who are aware that they are under scrutiny.

Research that asks respondents to provide information such as gas/electricity meter and odometer readings, and number of flights in the past year, at the beginning of the study and then again at later points, could provide very accurate information about how a communications initiative has affected participants' carbon footprints, although it would not be able to show exactly how changes were achieved (e.g., does fewer miles driven indicate fewer places visited, more consolidated journeys, or more sharing with others?). Eliciting the latter information would involve interviews or a detailed survey. Corral-Verdugo et al. (1999) found that asking respondents for quantified measures of behaviour led to more accurate self-reports. However, these kinds of data are not easy to collect from an unprepared sample; participants who do not have diaries/energy bills etc to hand and have little time are unlikely to be able to provide reliable estimates.

To test for the effect that using questionnaires, diaries, or other reporting measures might have on behaviour, a control group can be used that either does not complete some of the reporting tasks, or is not exposed to the 'intervention' but does do all the reporting. Nolan (2010) used this approach in a study of the impact of Al Gore's movie *An Inconvenient Truth*: her control group did not complete the questionnaire asking about behavioural intentions at the time of seeing the movie like other respondents, but simply answered the follow-up questionnaire later.

Similarly, to address the difficulty of isolating the impacts of one communication, one can compare the sample with a sample that does not experience the intervention under study. In his research into the impacts of *The Day After Tomorrow*, Leiserowitz (2004) conducted a telephone survey involving both moviegoers and those who did not see the movie. Staats et al. (2004), investigating the influence of involvement in EcoTeams, included questions about pro-environmental behaviour that were identical to those asked in an annual survey of a representative sample of the general public, and thus were able to see whether changes made by their EcoTeam respondents were replicated in the population as a whole.

In conclusion, overcoming problems of longitudinal studies that assess the impacts of climate change communications will generally require significant time and financial resources. However, it is important that such studies are conducted, as this research has demonstrated both the potential for long-term effects (including possibly some that take time to emerge), and the fact that other changes may be merely short-term, while intentions do not necessarily translate into action. The conclusions that could be drawn from the first time periods of my study were not the same as those that emerged from the later phases. Thus short-term studies might fail to adequately capture the impacts of climate change communications on attitudes, and especially behaviour, which it is vital for policymakers and practitioners (such as non-governmental organisations and filmmakers) to understand.

Acknowledgements

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5.5 Additional material relating to Paper 2: Respondents' involvement in climate change campaigns after seeing *The Age of Stupid*

In Paper 1, at the very end of section 4.5.3, I mentioned that future work would examine the rate of *The Age of Stupid* viewer sign-ups to the 10:10 campaign initiated by the filmmakers six months after the film was released, and to the local campaign groups encouraged to be present at screenings of the film during the opening week, analysing whether involvement in these campaigns persists and correlates with behavioural changes. Paper 2 does not report the results of this aspect of the study, for reasons of space and because they were apparently flawed by the same problems regarding causal attributions of behaviour already discussed in that paper. However, the results are included here for the sake of completeness.

Q4 respondents' awareness of, and involvement in, the 10:10 campaign, is shown in Figure 15 (below). A little fewer than half of the participants were aware of the campaign, and 16 had signed up to it.

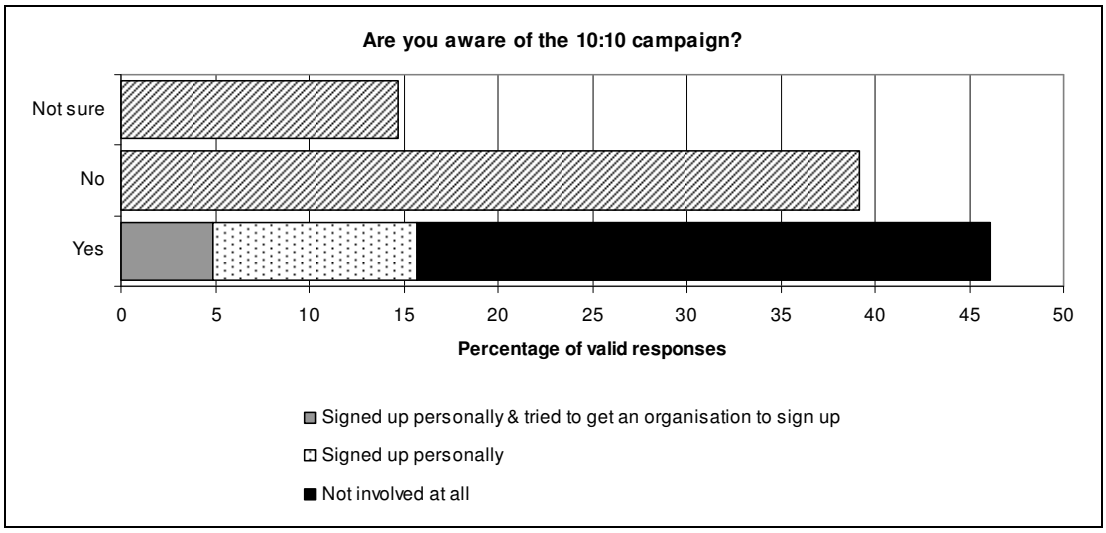

Figure 15: Q4 respondents' awareness of, and involvement in, the 10:10 campaign (*n* = 102)

Asked about whether they had signed up to receive information from "any groups campaigning wholly or partly about climate change/global warming" as a result of seeing the film, 28 participants said yes, of whom 27 stated that they were still receiving information. Fifteen people said that they had become involved in a campaign group as a result of seeing the film, or whom the majority were still involved (see Figure 16, p. 158). However, further examination of the data revealed that five people (one-third) who answered yes to this question then named groups that they had previously (in the same section of the questionnaire) stated that they were already involved in at the time of seeing the film. It is possible that they meant they had become *more* involved in these groups, or had renewed sporadic involvement, but this finding again suggests that causal attributions for behaviour are problematic.

A comparison of these results with responses to the statements shown in Figure 14 (p. 140) revealed that, in general, the proportion of the whole Q4 sample who had agreed on Q1 with those statements was smaller than for the sub-samples who stated on Q4 that they had joined 10:10, signed up to receive information, or become actively involved in a group campaigning about climate change. In other words,

those who were most engaged with climate change before seeing the film seemed most likely to report engagement with climate change campaigns afterwards. However, the sub-samples involved small numbers of people (15–28), and differences were sometimes slight.

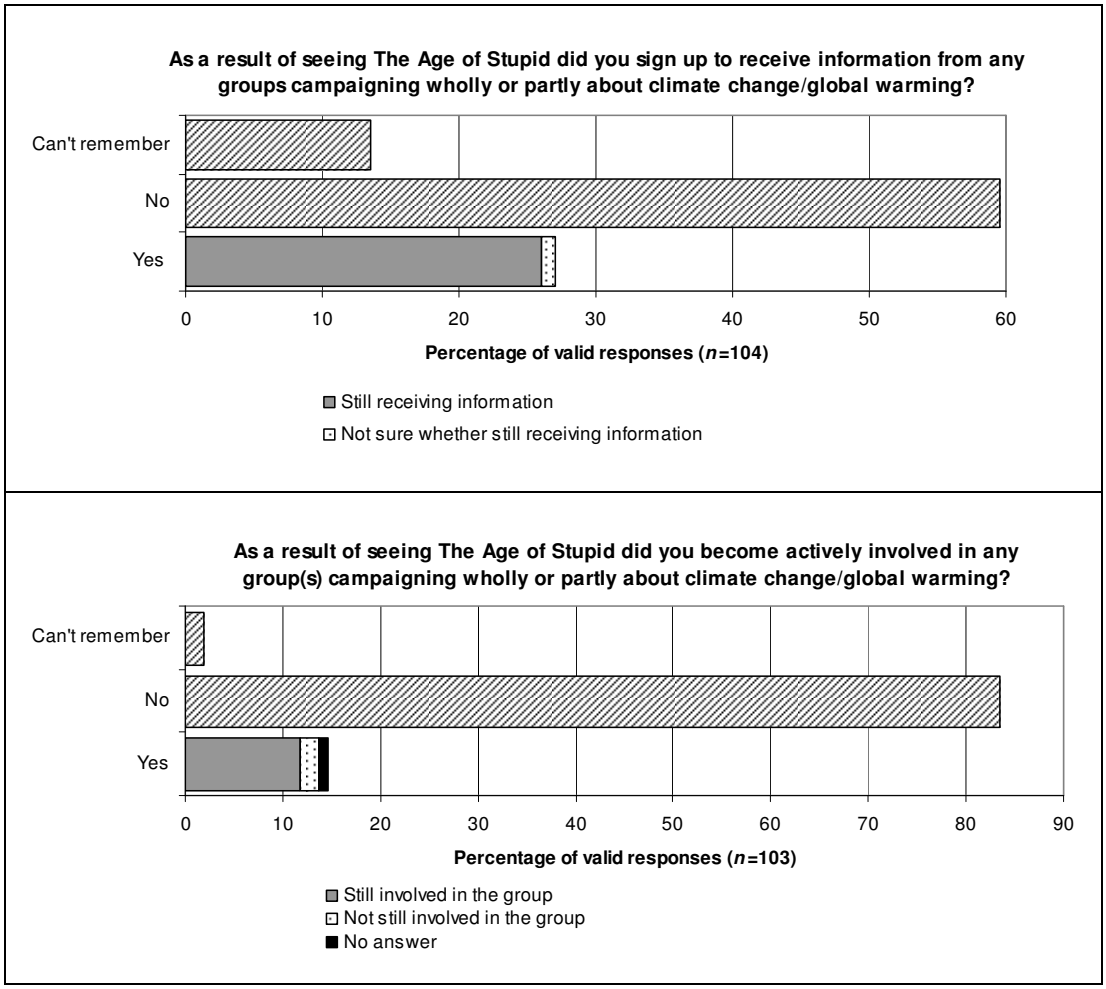

Figure 16: Q4 respondents' involvement in campaigning groups, attributed to seeing the film

Analysis of whether behavioural changes correlate with involvement in climate change groups/campaigns joined after seeing the film was not really feasible. Given the problems with the data mentioned above, it could not be determined with any degree of confidence who had actually joined a local group as a result of seeing the film, in order to discover whether they had taken significantly more action subsequently than those who did not (which would have been the hypothesis tested). A comparison of those who had signed up to 10:10 with those who had not would

theoretically be possible, since that campaign only started after the film so there can be no confusion about whether viewers joined it before or afterwards, but the number of people involved was too small for the tests of correlation to be valid.

The conclusion that can be drawn is that it seems likely that some viewers signed up to receive information and/or became involved in a climate change group/ campaign as a result of seeing *The Age of Stupid*, though perhaps not as many as attributed this action 15 months later to having seen the film. Most people who stated they had done so had continued receiving mailings or being involved. (Interestingly, when I later interviewed people who were involved in Carbon Conversations, one explained that he had signed up to join that group at a screening of *The Age of Stupid*.) Whether this led those viewers to take more action than others who did not join these groups is unknown, and in any case, such a correlation would not make clear whether that was because the groups facilitated behavioural change, or whether those most likely to change are the people who join such groups.

Chapter 6: Using the transtheoretical model of behavioural change to understand the processes through which climate change films might encourage mitigation action [Paper 3]

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Abstract

A number of recent films such as *An Inconvenient Truth* and *The Age of Stupid* aim not merely to inform their audience about climate change, but to engage them in taking mitigation action. This paper outlines the transtheoretical model of behavioural change, which incorporates six *stages of change* that individuals progress through as they change their behaviour, and ten associated *processes of change*. Using four climate change films as illustrations, I show how the model can be applied to identify the processes of change employed or depicted by sustainability communications. I then discuss research on the impacts of the films in the light of this analysis, considering the strengths and limitations of the movies' use/portrayal of processes of change with regard to encouraging viewers to change their behaviour. The paper concludes with recommendations for how film may be used more effectively as a tool to inspire climate change mitigation action.

Keywords

Climate change communications; Sustainability movies; Lower-carbon behaviours; Pro-environmental behaviour; Behavioural change; Transtheoretical model; Stages of change; Processes of change; Public attitudes; Climate change mitigation action

6.1 Introduction

In recent years, a number of full-length 'climate change films' have been made, including drama, documentaries, and hybrid genres. These range from *The Day After Tomorrow*, in which climate change is the basis for a typical Hollywood disaster movie, through documentaries that explain the problem, to *Just Do It*, which focuses on the exploits of climate action groups. Most of these films aim not merely to inform their audiences about climate change, but to persuade people to take action to reduce their greenhouse gas (GHG) emissions, and/or to get involved in political campaigns or even illegal 'direct action' (such as attempting to occupy coal-fired power stations). It is important to understand how climate change films attempt to engage viewers and whether these processes can be effective in motivating behavioural change.

Film offers a number of advantages as a means of promoting climate change mitigation action to individuals. Visual images can convey messages instantly in a way that makes them memorable (Nicholson-Cole, 2005), and movies in particular have immediacy, allowing us to receive information as if we were with the people speaking/acting. Such 'messengers' need to be credible and likely to be trusted (Breakwell, 2000; Chess and Johnson, 2007; Moser, 2008), and information should be presented by people with whom the intended audience can identify (Kahan, 2010). But information alone is not enough: knowledge by itself does not lead to action (Blake, 1999; Hungerford and Volk, 1990). Pooley and O'Connor (2000) and Moser (2007) argue that there is a need to appeal to people's emotions rather than just cognitive processes, and films are well-placed to do this through their use of imagery, music, and sound effects.

The temptation with a threat as great as climate change might be to use the dramatic possibilities of film to depict climate catastrophe. This is a common theme in climate discourses (Hulme, 2008), and Tickell (2002, p.737) suggests that we may need a "useful catastrophe or two" to "illuminate the issues". However, research by Spence and Pidgeon (2010) and Morton et al. (2011) suggests that positive framing of climate change mitigation, rather than focussing on what will be lost if we do not act, promotes more positive attitudes towards action. Fear can undermine belief that it is possible for individuals to 'make a difference' (O'Neill and Nicholson-Cole,

2009; Vasi and Macy, 2003) and may prompt undesirable defensive responses (Moser, 2007; Witte and Allen, 2000). Therefore it is recommended that communications about climate change should explain or show what people can do to mitigate the problem (Lorenzoni et al., 2006; Moser and Dilling, 2004).

Social cognitive theory posits that an important way that people learn is through observing others' attitudes, behaviour, and the outcomes of that behaviour (Bandura, 1977b). Media programmes (including films) featuring characters whom the audience like and identify with can improve knowledge and change attitudes; they can model desirable behaviours, which increases viewers' sense of self-efficacy (belief that they can adopt the behaviours) as well as cognitive skills regarding those behaviours; and they can motivate and positively reinforce action through depicting rewards for desirable behaviours and punishments for those that are undesirable (Bandura, 2004).

This theory is put to use in entertainment-education (E-E). E-E involves using entertainment media programmes such as radio serials/soap operas (e.g. Papa et al., 2000; Vaughan et al., 2000; Wray et al., 2004), television dramas (e.g. Hether et al., 2008), and telenovelas (e.g. Wilkin et al., 2007) as a means to influence viewers' knowledge, attitudes, and behaviour regarding social concerns. E-E has been shown to be successful in changing attitudes and behaviour with respect to a number of issues, including family planning (Vaughan and Rogers, 2000), HIV prevention (Vaughan et al., 2000), breast cancer screening (Hether et al., 2008; Wilkin et al., 2007), domestic violence (Usdin et al., 2004), and dowry payments (Papa et al., 2000).

Moyer-Gusé (2008) explains that E-E works through narrative engagement as well as the identification with and emulation of characters that is predicted by social cognitive theory. She suggests that the narrative format of E-E means that viewers are less likely to perceive it as having a persuasive intent, which may reduce the reactance sometimes triggered when persuasive messages are perceived as a threat to freedom, leading to message rejection. The narrative format also leads to the audience being engaged in a more immersive and less critical way (Shrum, 2004, cited in Moyer-Gusé, 2008) and therefore less likely to counter-argue with the persuasive message embedded in the storyline. Enjoyment of the story and

identification with one or more characters reduces avoidance, another problem for overtly persuasive messages (Moyer-Gusé, 2008). Climate change films can utilise the E-E approach, aiming to provide an entertaining and engaging narrative.

However, there are many psychological and contextual barriers (e.g. social norms, lack of enabling infrastructure) that may prevent people from taking action even if they are inspired to do so (Gifford, 2011; Howell, 2011; Lorenzoni et al., 2007). It can also be difficult to overcome the force of habit (Hargreaves et al., 2010; Oeuellette and Wood, 1998; Webb and Sheeran, 2006).

Efforts have been made to investigate the impact of climate change films on viewers' attitudes and (occasionally) behaviour. This includes research on *The Day After Tomorrow* (Balmford et al., 2004; Leiserowitz, 2004; Lowe, 2006; Lowe et al., 2006; Reusswig et al., 2004); *An Inconvenient Truth* (Beattie, 2011; Beattie et al., 2011; Nolan, 2010); *The Age of Stupid* (Howell, 2011, 2012); and *Just Do It* (Lander, 2012). These studies give a mixed picture: the films generally raise concern about climate change, and often promote motivation to act or even behavioural intentions. The effect on behaviour is not so clear, especially as it is rarely studied and there are methodological problems with doing so (Howell, 2012).

Behaviour change is a process, rather than an event. In section 6.2 I introduce a process model of behavioural change, the *transtheoretical model* (also known as the *stages of change model*), which has potential for use in the field of sustainability-related communication because it can help identify the processes of change that are best employed or modelled by movies for viewers at different stages of change. To illustrate how the model might be useful, four climate change films that vary in terms of intent, genre, focus, mood and messages are briefly described (section 6.3), then analysed using core concepts of the model (section 6.4), to investigate how they might encourage individuals to take climate change mitigation action of various kinds, and to draw lessons for future films (and indeed, sustainability communication more generally) (section 6.5). Conclusions are presented in section 6.6. The focus of the paper is on presenting the model and giving an example of how it might be employed, in the belief that it may prove a valuable tool for use in empirical research and by climate change communication practitioners seeking to improve the efficacy of their work. A rigorous investigation involving identifying film viewers' stage of

change with regard to particular climate change mitigation actions and testing whether films portraying different processes of change promote stage progression is not attempted here. Instead, other analyses are used insofar as possible to discuss the impacts of the films in the light of the insights gained from the model.

6.2 The transtheoretical model of behavioural change

6.2.1 Stages and processes of change

The transtheoretical model (TTM) of behavioural change was developed by James Prochaska, Carlo DiClemente, and colleagues, within the field of health psychology (DiClemente and Prochaska, 1982; DiClemente et al., 1991; Prochaska, 1994; Prochaska and DiClemente, 1982, 1983; Prochaska et al., 1992; Prochaska and Velicer, 1997; Prochaska et al., 1994). Their research on interventions to help individuals overcome addictions and/or develop healthy behaviours suggests that behavioural change is a process involving several stages, defined in Table 16, below (Prochaska et al., 1992; Prochaska and Velicer, 1997). Individuals do not necessarily progress through these stages linearly, but may 'relapse' back to an earlier stage (Prochaska et al., 1992), as illustrated by Figure 17 (p. 166).

Table 16: Stages of change as defined by the transtheoretical model

Stage	Definition
Precontemplation	No intention to change behaviour in the foreseeable future (usually measured as the next six months). Individuals may be unaware or under-aware of problem behaviours, or have tried to change but relapsed.
Contemplation	Thinking about changing behaviour (often measured as seriously considering action within the next six months), but not committed to action now. Weighing up pros and cons of current situation and of change.
Preparation	Intending to take action in the near future (usually measured as the next month) and preparing to do so. Small behaviour changes may already have been made.
Action	Behaviour changes (usually measured according to some specific criteria) have been achieved for up to six months.
Maintenance	Behaviour changes have been maintained for more than six months. Not a static stage as individuals still need to work to prevent relapse.
Termination	New behaviour has become habitual; no temptation to relapse. 'Termination' is not always a practical reality – for some behaviours, a lifetime of maintenance is realistic. This stage is often not mentioned.

Sources: Based on information from Prochaska et al. (1992) and Prochaska and Velicer (1997).

The model also identifies ten common processes used to facilitate behavioural change (Prochaska and Velicer, 1997), outlined in Table 17 (p. 167). Different processes of change have been found to be emphasised more at different stages of change, with 'cognitive/affective processes' such as consciousness-raising and self-re-evaluation utilised more at earlier stages of change, while 'behavioural processes' such as stimulus control and counter-conditioning are more important at later stages (DiClemente and Prochaska, 1982; DiClemente et al., 1991). Table 18 (p. 168) shows the change processes considered most important at each stage of change. Proponents of the model recommend that processes of change should be matched to the stage of change reached by the target individual/group (Prochaska et al., 1992; Prochaska and Velicer, 1997).

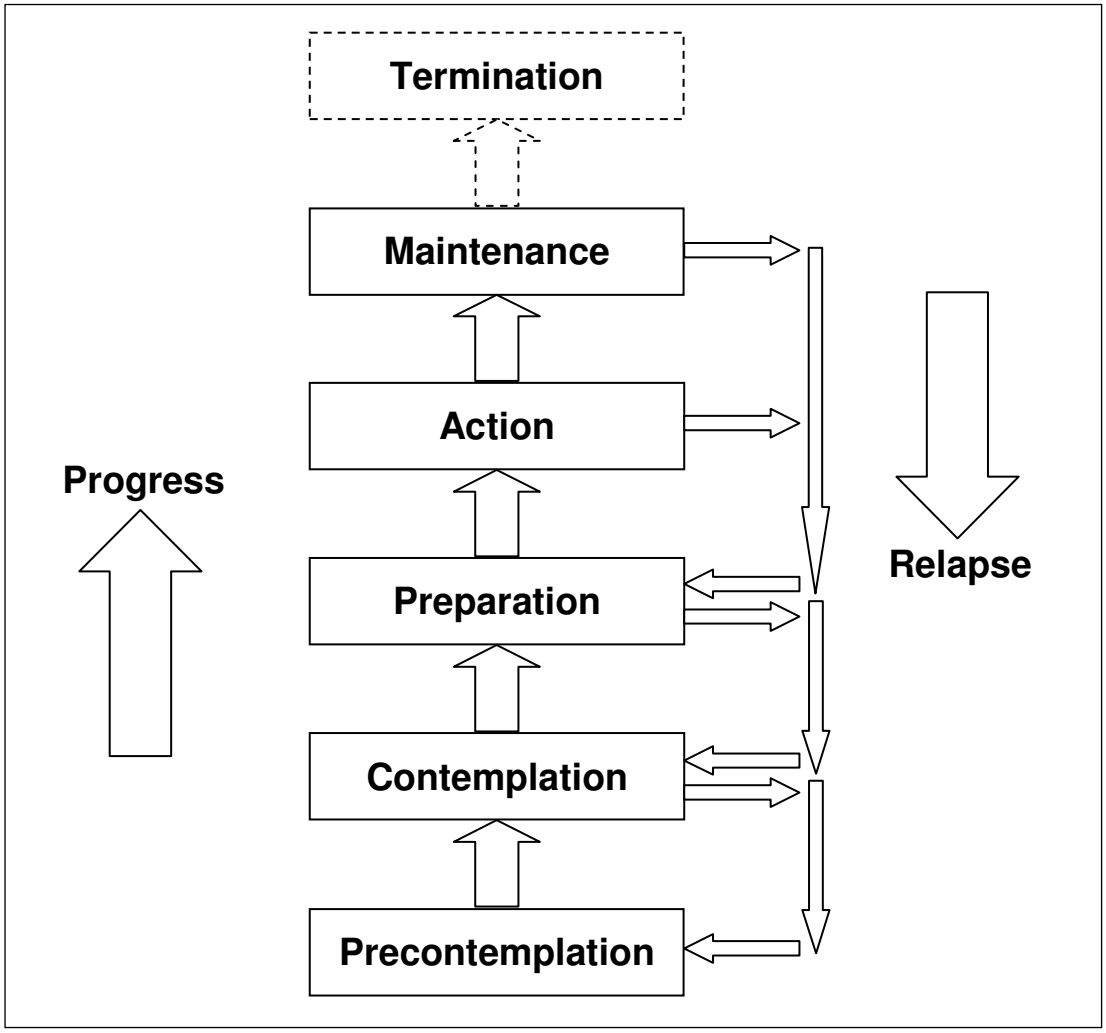

Figure 17: Progression through the stages of change
Source: Based on a diagram from Atkins (2009).

Table 17: Processes of change as defined by the transtheoretical model

Process	Definition	Example interventions/techniques
Cognitive/affective processes		
Consciousness-raising	Increasing awareness about problem behaviour (causes, effects, solutions)	Education, media campaigns, feedback, *articles about climate science*
Dramatic relief	Being moved emotionally with regard to the problem	Role play, personal testimonies, media campaigns, *vivid images of suffering*
Environmental re-evaluation	Assessing how one's behaviour affects one's social/physical environment	Empathy training, family interventions, *ecological footprinting*
Self-re-evaluation	Assessing how one thinks and feels about oneself with regard to problem behaviour	Value clarification, healthy role models, imagery, *'green values' questionnaires*
Self-liberation	Belief that one can change and commitment to do so	New Year's resolutions, public pledges, *adopting an annual 'carbon ration'*
Behavioural processes		
Contingency/reinforcement management	Instating consequences for behaviour – costs and/or rewards	Self-reward, contingency contracts, group recognition, *carbon taxation*
Helping relationships	Open, trusting relationships with others who support behaviour change	Self-help groups, buddy systems, *Carbon Conversations*[a]
Counter-conditioning	(Learning and) substituting alternatives for problem behaviour	Depends on problem behaviour, *e.g. cycling/walking instead of driving*
Stimulus control	Removing cues for undesired habits; adding prompts for desired ones	Avoidance, restructuring environment, *"switch off" stickers on light switches*
Social liberation	Increase opportunities available in society/alternatives to problem behaviour	Advocacy, empowerment, policy interventions, *improve public transport*

[a] Carbon Conversations: six meetings about climate change and carbon reduction (Randall, 2009).
Source: Based on information from Prochaska and Velicer (1997), with sustainability-specific examples by author in italics.

Table 18: Processes of change matched with stages of change

Precontemplation	Contemplation	Preparation	Action	Maintenance
Consciousness-raising				
Dramatic relief				
Environmental re-evaluation				
	Self-re-evaluation			
		Self-liberation		
			Contingency management	
			Helping relationships	
			Counter-conditioning	
			Stimulus control	

Note: The process of 'social liberation' is not included because it has been regarded as outside the remit of the health behaviour programmes from which the model was developed.
Source: Prochaska and Velicer (1997). Used by permission.

Individuals at later stages of change report higher levels of 'self-efficacy' (confidence that they can change their behaviour and maintain changes) than those at earlier stages of change (DiClemente et al., 1991). There are also changes in individuals' 'decisional balance' (relative weighting of the pros and cons of changing their behaviour), with progression from contemplation to action being associated with a significant increase in the evaluation of pros of change, and a smaller decrease in the evaluation of cons (Hall and Rossi, 2008; Prochaska, 1994).

6.2.2 Applications and criticisms

The TTM has been used to design interventions to promote positive behaviours such as physical activity/exercise (Adams and White, 2003; Spencer et al., 2006), healthy eating (Armitage et al., 2004; Horwath, 1999; Spencer et al., 2007), and mammography screening (Ashworth, 1997; Spencer et al., 2005), as well as to help people avoid pregnancy and sexually-transmitted diseases (Horowitz, 2003) and overcome harmful behaviours such as smoking and substance abuse (Migneault et al., 2005; Spencer et al., 2002). The apparent success of some of these communication and intervention programmes suggests that it might be worth applying insights from the model to the promotion of lower-carbon and other sustainability-related behaviours.

However, the model has garnered little attention in the sustainability field to date. The UK Department for Environment, Food and Rural Affairs employs it "on the basis of its conceptual lessons only and does not use it to inform the development of practical interventions" (Defra, 2009, p.5). A study by Duddleston, Stradling, and Anable (2005) categorised people according to stages of change with regard to travel attitudes and behaviour, and Steg (2008) suggests tailored information could be given according to stage of change to promote household energy conservation. He, Greenberg, and Huang (2009) use the model to assess the utility of existing energy feedback technologies designed to motivate sustainable energy consumption behaviours, and to make recommendations for the design of future feedback technologies suitable for individuals at different stages of change regarding sustainable energy usage. Two studies (Chib et al., 2009; Gatersleben and Appleton, 2007) have attempted to categorise participants with regard to waste behaviours and cycling respectively, and then implement an intervention designed to change behaviour, although the categorisation of stages did not necessarily match the definitions used in the TTM and the interventions were not tailored to different stages of change.

Questions have been raised about both the theoretical validity of aspects of the TTM, and the effectiveness of model-based interventions (Adams and White, 2003; Bridle et al., 2005; Herzog et al., 1999; Rosen, 2000; Weinstein et al., 1998). However, researchers suggest that many studies are poorly designed, and stage-based interventions often fail to represent accurately all facets of the TTM (Ashworth, 1997; Bridle et al., 2005; Hutchison et al., 2009).

6.2.3 The utility of the TTM with respect to sustainability communications

Although there is clearly a need for more research into the theoretical basis of the model and the effectiveness of well-designed interventions, the evidence that currently exists that different change processes are used at different stages of change (DiClemente and Prochaska, 1982; DiClemente et al., 1991; Herzog et al., 1999; Rosen, 2000) makes an analysis of the processes employed by or modelled in climate change films worthwhile because this helps with understanding how different films (and different types of content) might appeal to and motivate different audiences. For

example, even if behavioural change should be conceptualised as a continuum, rather than as progress through discrete stages, as Bridle et al. (2005) and Weinstein, Rothman, and Sutton (1998) suggest may be the case, it seems likely that different change processes will be important as individuals move along the continuum from unawareness to altered lifestyles.

Sood, Menard, and Witte (2004) argue that stage models of change are important in the design and evaluation of E-E, because they help with the identification of the stage of change intended audiences have reached, with designing messages appropriate for these audiences, and with mapping and understanding changes made in response. By extension, the TTM can be employed in the design and evaluation of behaviour change communications more generally. Borrayo (2004), for example, describes how the TTM was used to design a short film to promote breast cancer screening, while Cottone and Byrd-Bredbenner (2007) applied the TTM to evaluate the effectiveness of the film *Super Size Me* as a tool in nutrition education, and were able to determine the movie's impacts on a range of model parameters such as stage of change and self-efficacy. This aids with comprehending not only *whether* a particular communication promotes change, but *how* it might do so. Stage models such as the TTM are also very sensitive to change, and thus can add to the literature on media effects. An evaluation that simply measures whether a desired end result has been achieved (e.g. whether viewers of a climate change film have adopted particular lower-carbon behaviours) might conclude that it has no effect, where an evaluation using the TTM could discover that the film had encouraged stage progression, if not actual behavioural change.

The TTM is not the only stage model of change, but it was chosen for this analysis because it is an extremely popular and enduring model (Horwath, 1999; Spencer et al., 2007) and has been used successfully both to design interventions promoting a variety of behaviours (Spencer et al., 2006; Spencer et al., 2002; Spencer et al., 2005) and to evaluate communications in other fields (e.g. Cottone and Byrd-Bredbenner, 2007). Using the model to analyse what processes of change climate change movies depict should help to identify which audiences those films are best suited to (communication evaluation), and how such films could be improved by focussing on more or different processes (communication design).

6.3 Four climate change films

The films examined in this paper were chosen to offer variety in terms of genre, mood, messages, and filmmakers' intentions, and also because some research has been done on the impact of each film. It is necessary to have this available in order to discuss the effects of the films in light of the insights gained from the TTM.

6.3.1 The Day After Tomorrow (USA, 2004)

Unlike the other films examined here, which all have associated websites promoting personal action to mitigate climate change in some way, it is not clear that the makers of Hollywood climate-catastrophe movie *The Day After Tomorrow* had any intention to promote behavioural change. Although director Roland Emmerich spoke of being able "to give people a message" (Gilchrist, 2004), he is also quoted as saying, "We just wanted to make a movie people would enjoy" (Bowles, 2004). As the film did well at the box office, ranking sixth highest-grossing disaster movie in the USA since 1979 (Box Office Mojo, 2011), and some scientists and other commentators welcomed the fact that it might bring climate change to public attention, despite criticising its many scientific inaccuracies (see e.g. Hyde, 2004; Monbiot, 2004; ScienceDaily, 2004), the film is worth including in this analysis.

The movie is pure fiction, with a familiar, plucky-hero-overcomes-disaster narrative. Dennis Quaid stars as paleoclimatologist Jack Hall, whose warnings about the potential for abrupt climate change go unheeded by the USA government. Global warming then causes a series of extreme weather events and the shutdown of the Gulf Stream, ushering in a new ice age in Western Europe and North America within a matter of days. Spectacular special effects and iconic images include the Statue of Liberty hung with enormous icicles and the destruction of the famous 'Hollywood' sign by a tornado. Jack's son Sam is stranded in New York and Jack, promising "I will come for you", sets off from Washington to drive and then walk through the storm to reach him. They survive (with a few friends) and are airlifted to Mexico, where millions of Americans are living as refugees.

6.3.2 An Inconvenient Truth (USA, 2006)

Perhaps the best-known climate change film is *An Inconvenient Truth*, which won an Academy Award® for Best Documentary Feature. The website associated with the movie, www.climatecrisis.net, states that the estimated worldwide audience for the film was 5 million people; Box Office Mojo puts worldwide earnings at US$49.8 million.

The film shows former Vice President of the USA Al Gore giving a slideshow presentation of the evidence for climate change and discussing actual and predicted impacts, using graphs, maps, statistics, photographs, and animations. Interspersed with the lecture are segments that focus on Gore's life: for example, his young son's near-fatal car accident and his sister's death from lung cancer. These sections are illustrated with news clips and stills as well as film footage, with (sometimes emotional) voiceovers by Gore.

Almost the whole movie focuses on the problem of climate change; only at the very end does Gore touch on solutions (such as renewable energy and carbon capture and storage). He finishes his presentation by stating that "Future generations may well have occasion to ask themselves, 'What were our parents thinking? Why didn't they wake up when they had a chance?' We have to hear that question from them, now." The credits sequence then includes a list of things to do, such as "Buy energy efficient appliances"; "When you can, walk or use a bicycle"; and "Write to Congress".

6.3.3 The Age of Stupid (UK, 2009)

Echoing the question with which Gore ends *An Inconvenient Truth*, *The Age of Stupid* features Pete Postlethwaite as an old man living alone in 2055 in a world devastated by climate change, watching documentary footage from 2008 and asking, "Why didn't we save ourselves while we had the chance?" The movie thereby combines a fictional dystopian future with six interwoven documentary strands focussing on personal stories that highlight different aspects of climate change and fossil fuel dependency. Animated sequences illustrate information such as average energy use per person in different countries.

Characters include UK wind farm developer Piers, struggling to overcome local opposition to proposed turbines; 82-year-old French mountain guide Fernand, through whose eyes we see the retreat of Alpine glaciers; businessman Jeh, starting up a low-cost airline in India; and lifelong Shell employee Alvin, who lost his home and saved over 100 people when Hurricane Katrina hit New Orleans. It is he who, reflecting on humanity's wastefulness, names our age "The Age of Stupid".

The Age of Stupid and associated Not Stupid campaign aimed to "turn 250 million viewers into physical or virtual activists" (Not Stupid, undated). The film premiere was screened in 62 cinemas simultaneously around the UK in March 2009, and a 'global premiere' took place the following September in 63 different countries. In addition, there have been 1497 screenings organised by individuals and groups of various kinds (Indie Screenings, undated).

6.3.4 Just Do It (UK, 2010)

Subtitled "A tale of modern-day outlaws", *Just Do It* is a feature-length documentary by Emily James, who spent a year 'embedded' in UK climate action groups Plane Stupid, Climate Rush, and Climate Camp, filming their meetings and direct action campaigns. Viewers see activists blockading the Royal Bank of Scotland headquarters in London in protest at "banks which finance climate change", attempting to breach a security fence to shut down a coal-fired power station, and locked in cages after being pre-emptively arrested en-route to protest at the UN climate conference in Copenhagen in December 2009. The film also reveals the meticulous planning, consensus decision-making, and practical preparations behind the scenes.

In addition to the action, the film features interviews with people talking in retrospect about their experiences, and their thoughts and feelings about climate change and involvement in the campaigns. Like *The Age of Stupid*, *Just Do It* follows particular individuals, but unlike in the former film, we hardly see anything of their personal lives – viewers are invited to relate to them only as activists.

The film features lively background music and upbeat, humorous narration by one of the activists. Arrests and police violence are documented but the action is generally framed very positively.

6.4 Analysis: climate change films and processes of change

Each film was watched more than once, and detailed notes were made about the content, and the images and music used in different scenes. These notes were then used to identify examples of the TTM processes of change (such as given below). In some cases there were many examples, in others only one or two; the following analysis attempts to reflect the weight given in each film to each process, determined by how many examples of each process were identified and an estimate of the relative amount of time accorded to each in each film.

6.4.1 The Day After Tomorrow

The process most frequently in evidence in this film is dramatic relief (emotional engagement). Opening shots panning over Antarctica to haunting background music invite appreciation of the beauty of nature. However, danger is abruptly signalled: the ice shelf from which Jack is drilling ice cores cracks in seconds, almost under his feet. Thereafter, the sense of threat builds steadily as weather events become rapidly more extreme and news reports convey surprise and alarm. The use of iconic images such as the Hollywood sign and the Statue of Liberty encourages viewers to experience shock and fear because of the magnitude of the disaster and what could be lost. Set against the large-scale action are many personal stories to engage the audience's empathy with, and therefore concern for, the characters: for example, Sam's romantic attachment to a classmate; the fate of a child with cancer; and above all, Jack's mission to reach his son in New York.

Early in the film, Jack gives a presentation to an international gathering of scientists and politicians during which he explains how global warming could possibly lead to the shutdown of the Gulf Stream. This and scenes in which scientists are creating, using, and explaining climate models, promote consciousness-raising about climate change among viewers because they provide information about the potential impacts of the problem, and show how scientists predict such effects.

Some characters in the film experience environmental and self-re-evaluation as they come to understand the extent of the impacts of anthropogenic global warming and accept responsibility for the problem. Jack declares that the future "depends on

whether or not we're able to learn from our mistakes", and at the end of the film the new President of the USA (the formerly intransigent Vice President) announces on TV, "For years, we operated under the belief that we could continue consuming our planet's natural resources without consequence. We were wrong. *I* was wrong."

6.4.2 An Inconvenient Truth

The process most frequently employed by *An Inconvenient Truth* is consciousness-raising, through the traditional method of a lecture. Many of the data are presented in ways that encourage dramatic relief, by making human connections that prompt feelings of empathy. For example, Gore graphically illustrates how millions of people will be affected by sea-level rise, and shows photographs of scientists to give a human face to their work. He also employs humour to develop rapport with his audience, and the non-lecture sections of the film seem designed specifically to encourage sympathetic emotional engagement with Gore as a person.

Viewers are encouraged to begin environmental re-evaluation by Gore showing images of the devastation wrought by Hurricane Katrina while stressing that this scale of disaster is something *new* for the USA, and to connect environmental impacts directly with human behaviour through the juxtaposition of images of destruction of nature alongside smoking industrial chimneys. Gore models self-re-evaluation through talking about how the near death of his son made him re-think his purpose in life, and how his sister's death from lung cancer painfully brought home to him his family's part in growing tobacco. His questions at the end about how future generations will regard us appear to be a plea for viewers to 'wake up' and engage in re-evaluation of their behaviour.

Self-liberation is promoted towards the end of *An Inconvenient Truth*, when Gore gives a 'pep talk' about what "we" have achieved, such as the successes of the civil rights movement, suggesting that we have the ability to mitigate climate change, and urging people to take action: "It is your time to seize this issue. It is our time to rise again to secure our future." Social liberation is also touched upon: Gore mentions technologies such as renewables and carbon capture and storage, which offer societal-level alternatives to carbon-intensive electricity generation.

6.4.3 The Age of Stupid

Much of this film involves consciousness-raising in various ways, including the animated sequences that present statistics and explain proposed climate mitigation policies, and the documentary strands that highlight aspects of the problem including causes, consequences, and responses. Piers and his wife Lisa are shown calculating their household carbon footprint, modelling another form of consciousness-raising (and environmental re-evaluation), because through this they discover the relative GHG emissions associated with different activities, and understand better the contribution they are making to climate change.

Dramatic relief is a strong feature: for example, the imagery of the fictional dystopian future (refugee camps, famous landmarks destroyed etc), the edgy, repetitive music associated with these scenes, and the (fictional) news clip voiceovers that announce, for instance, that it has become necessary to eat pets all suggest a sense of threat. Viewers are also invited to engage emotionally through characters to empathise with (an intimate portrait of Piers and his home life is presented, including footage in which he and Lisa are drinking their morning cup of tea in bed while the answerphone plays a wind farm opponent's threatening message, though we don't see inside the lives of the wind farm protestors), and characters who are less attractive (airline-entrepreneur Jeh raging at his employees). A common discourse in the film is one of emergency, even catastrophe: humans "face extinction", not having "saved ourselves" from "climate crisis"; we should treat climate change like "a war situation".

Environmental and self-re-evaluation are often intertwined: Fernand says, "I think everyone in the future will perhaps blame us for not thinking to protect the environment" and Postlethwaite's character (who frequently uses the words "our" and "we") speaks regretfully of the fatal impacts on his children and grandchildren of his generation's failure to act. The title suggests that we are acting stupidly, and the opening credits emphasise the personal message by stating "and you" after the list of individuals featured in the film.

Self-liberation is modelled by Piers and Lisa deciding not to fly on holiday. A small part of the film portrays counter-conditioning: Piers and family travel to France by train rather than flying; they also talk about other ways they reduce their carbon

footprint. Fernand is seen growing his own vegetables. Ideas for social liberation include mention of the policies of contraction and convergence and personal carbon rationing, as well as the storyline about wind farm developments, and Fernand, Piers, and Lisa attend protests to demand change.

6.4.4 Just Do It

This film has a rather different emphasis to the previous two, in that it focuses on climate change mitigation action rather than on the problem. Viewers see self-liberation in practice as people go through the process of making a commitment to act (in the form of political campaigning rather than personal emissions reductions) and preparing to do so (then actually carrying out the action). The film also expresses a strong belief that it is possible to effect change, although when activist Marina is asked, "Does all of this do any good?" she pauses for a long time. Her eventual response stresses how taking part in direct action is empowering and involves "taking back control of your life", very much a self-liberation process. Social liberation is presumably the desired end of campaigners' actions, although there is little in the film about proposed alternatives to the policies and practices they oppose, other than the conversion of abandoned land and greenhouses near Heathrow airport into a thriving community garden.

Helping relationships are very prominent in *Just Do It*. Protestors plan and carry out actions together in 'affinity groups', and share skills, food, and tools. At one point an activist is caught by a policeman; he shouts "de-arrest!" and other activists help release him from the officer and thereby escape arrest.

Consciousness-raising is also focussed on action rather than the problem: the film shows how affinity groups work, how consensus decisions are taken, and what actually happens at protests.

Dramatic relief is encouraged by the use of lively background music, focus on particular characters to relate to, and humour. For example, footage of the protest at the G20 meeting in 2009 is accompanied by the narrator saying, "Climate Camp are planning to turn the heart of the financial district into a street party"; when police in riot gear move in he calls them "a bunch of uninvited party-poopers." The violence

of the police response is effectively highlighted and given 'shock value' by this light-hearted introduction.

6.5 Discussion

The foregoing analysis suggests that these films employ or depict several processes of change that the TTM suggests should encourage attitudinal or behavioural change. No research has yet attempted to assess whether climate change films have been successful in promoting stage progression according to the model; however, as mentioned in section 1, various studies have attempted to determine the impact of the films examined here on viewers' attitudes, behavioural intentions, and in some cases, actual behaviour. These and other studies can shed some light on how films might encourage climate change mitigation action.

The processes of change most frequently associated with these films are consciousness-raising and dramatic relief. Visual media are particularly suitable for consciousness-raising because of their ability to convey new information and complex ideas quickly and memorably (Nicholson-Cole, 2005). Given that people need to trust and identify with 'messengers' (Chess and Johnson, 2007; Kahan, 2010), and with media characters from whom they might learn through emulation (Bandura, 2004), it is important that a range of figures (whether fictional or real) appear in films that attempt to influence audiences. Research on the impacts of *The Age of Stupid* found that viewers did not universally empathise with wind farm developer Piers (Howell, 2011) so it is useful that the film also features other, quite different individuals. In *Just Do It,* almost all the activists followed are young, and all are white, which may give an unintended message about who the film is relevant to, and/or limit its appeal. Audience members commented on the lack of older people and the fact that characters appeared to be engaged full-time in activism instead of having jobs, which had a distancing effect (Lander, 2012). *An Inconvenient Truth* relies on the credibility of Al Gore for its consciousness-raising effect; no doubt his celebrity encouraged interest in the film, but in the USA, Republicans were far less likely than Democrats to report that it influenced their belief in global warming (Borick and Rabe, 2010).

Film is an ideal medium for dramatic relief: storytelling, vivid imagery, music, pace, and sound effects can all be used to emotionally engage an audience. As discussed earlier, there can be problems when the presentation creates feelings of fear. *The Day After Tomorrow* and *The Age of Stupid* both utilise a 'climate catastrophe' narrative, but in the case of the former film this was lightened by humour and was resolved by an upbeat ending – the threat to the characters with whom viewers are encouraged to identify seemed to be over. Howell (2011) found that viewers of *The Age of Stupid* did not generally find the disaster-framing of the movie disempowering, exhibiting increased motivation to act and belief that they could do something about climate change immediately after seeing the film; however, she suggests that this could be because they already knew what to do to reduce emissions.

Climate change films can also encourage viewers to engage in environmental and self-re-evaluation. This again may need to be modelled by characters they can relate to (Bandura, 2004). In *The Day After Tomorrow*, Jack's struggle to get the Vice President of the USA to listen to his warnings could lead viewers to infer that responsibility lies with scientists and politicians. Scientists are responsible for communicating the threat to politicians (never the public in this film); the politicians are the ones ignoring the message and refusing to take action. There is no storyline about individual mitigation behaviour. For example, nobody mentions, let alone questions, the GHG emissions associated with Sam and his classmates flying to New York to take part in a quiz. It is scientists we see re-evaluating the impacts of climate change, and a politician who models self-re-evaluation, not 'ordinary' individuals. It is perhaps not surprising, then, that a study by Reusswig, Schwarzkopf, and Pohlenz (2004) revealed that German viewers agreed more strongly after seeing the film than beforehand that the government should play a big role in taking action on climate change, but it had a negligible influence on views about the role of individuals. Similarly, Beattie, Sale, and McGuire (2011) found that one clip from *An Inconvenient Truth*, which emphasises the contribution of China to global warming, led to an increase in 'shifting responsibility' for action on climate change from self to others.

Self-liberation was a feature of some of the films, particularly *Just Do It*, but this perhaps needs to be emphasised more, as according to the TTM it is the pivotal process that occurs between thinking about change and actually beginning it. Self-liberation involves believing that one can make necessary changes. Interestingly, individuals who were shown clips from *An Inconvenient Truth* agreed more strongly afterwards with statements such as "I can personally help reduce climate change" and "I feel empowered in the fight against climate change" even when the clips were not positive (Beattie et al., 2011). However, this study did not test whether participants felt increased efficacy in relation to specific actions, nor whether they planned (or took) any action.

In addition to the confidence individuals feel that they can change their behaviour and maintain changes, another aspect of efficacy is belief that changes made will be effective in overcoming the problem, and this is something climate change films can encourage. For example, *Just Do It* gives information at the end of the film about the apparent success of some of the campaigns featured. It is worth stressing the advantages of acting together, as *Just Do It* does; groups can provide many benefits, including moral support, shared learning, and accountability (Howell, 2009) and can therefore build capacity and effect more change (Middlemiss and Parrish, 2010; Staats et al., 2004).

By their nature, films generally employ or involve cognitive/affective processes; they are not suitable vehicles for behavioural processes such as contingency management. However, some of the films analysed did show behavioural processes in action. Filmmakers keen to stimulate action could give more attention to portraying the variety of processes that help to support and maintain behavioural change.

The TTM suggests that the fact that films employ and depict more cognitive/affective than behavioural processes of change makes them more appropriate 'interventions' to use with audiences at earlier stages of change. It is difficult to know whether climate change films gain such audiences, as no studies have directly assessed viewers' stage of change, but some studies include information that can perhaps be used as proxy measures. For example, Howell (2011) found that in the year prior to seeing *The Age of Stupid*, 61.8% of viewers

sampled had donated money to, and 36.1% were actively involved in, groups campaigning about climate change. Furthermore, respondents later reported several actions they were doing but not because of having seen the film. These results suggest that many viewers of that film could have been at the action or even maintenance stage for some lower-carbon behaviours. Akter and Bennett (2011) discovered that Australians who had seen *An Inconvenient Truth* were significantly more likely to report having reduced their use of motorized vehicles and/or electricity than non-viewers, and claim that the film influenced behaviour, but the study appears to show correlation rather than causality and it seems equally likely that people already engaged in climate change mitigation action are more likely to see the movie than those who are not. Individuals who saw it at a free showing organised by an NGO in the USA exhibited high levels of belief in climate change and motivation to act beforehand (Nolan, 2010). The film has, however, been incorporated into the school curriculum in several countries (Climate Crisis, undated), which makes it likely it will be seen by children at a range of stages of change with respect to lower-carbon behaviours.

An E-E format, embedding information and behavioural role models in serial dramas not perceived to be primarily about climate change, might reach a wider and more appropriate audience than climate change movies, avoiding problems of avoidance and reactance. However, this could be difficult to arrange as climate change is a controversial topic and broadcasters are wary of controversy, especially in media-saturated commercial broadcasting environments – E-E programmes that have addressed controversial topics have tended to air in developing countries where there is less media saturation (Singhal and Rogers, 2004). Instead, filmmakers could learn from E-E and focus more on embedding intended persuasive content in enjoyable movies rather than making the messages overt.

Being primarily a summer entertainment movie, *The Day After Tomorrow* is more similar to E-E programmes than the documentary films studied here. It thus seems likely to attract a different audience, and indeed UK viewers of this movie did not seem particularly concerned about climate change beforehand (Balmford et al., 2004; Lowe et al., 2006). They therefore might have been at earlier stages of change, so the TTM would suggest that the processes of change it employs should work well

with this audience. However, Lowe et al. (2006) found a decrease in viewers' evaluation of the likelihood that they would experience climate change impacts in their own lifetime. This is important because people are less likely to respond to a threat if they do not feel personally vulnerable (Das et al., 2003). Other studies also found a decrease among viewers in the perceived likelihood of climate change (Lowe, 2006; Reusswig et al., 2004) or less realistic expectations of climate change impacts than people who hadn't seen the film (Balmford et al., 2004). This may be due to the fact that the movie sacrificed realism for dramatic effect; in TTM terms, it concentrated on dramatic relief at the expense of consciousness-raising. The film did increase concern about climate change (Balmford et al., 2004; Leiserowitz, 2004; Lowe et al., 2006) but a study that included a later follow-up found that this was short-lived and viewers did not know what to do (Lowe et al., 2006). This demonstrates the necessity of teaming emotional engagement with solution messages (dramatic relief with consciousness-raising), as in E-E. Leiserowitz (2004) and Lowe et al. (2006) found respondents were more likely to express intentions to take climate change mitigation actions having seen *The Day After Tomorrow*; Balmford et al. (2004) found no change in the number of emission-reducing activities people planned to undertake.

According to the model, evaluation of the efficacy of climate change films need not depend on whether individuals actually change their behaviour. Indeed, those that utilise primarily cognitive/affective processes of change should be expected to encourage early stage progression, rather than behavioural change. Nolan (2010) found that *An Inconvenient Truth* inspired little concrete action among students who were recruited to watch it and who did not display high levels of concern about climate change beforehand, but the film did increase concern and motivation to act immediately afterwards. This might be evidence of progression from precontemplation to contemplation, or from contemplation to preparation, among an audience who were at early stages of change. The finding that viewers often do not act on the increased motivation or behavioural intentions prompted by climate change films (Howell, 2011; Lowe et al., 2006; Nolan, 2010) suggests that films need to be coupled with other interventions if they are to help people progress from contemplation to action. Armitage et al. (2004) suggest the use of

implementation interventions (Gollwitzer, 1993); public commitments such as pledges may also be useful (Cobern et al., 1995; Schultz et al., 1995).

The Day After Tomorrow, *An Inconvenient Truth*, and *The Age of Stupid* essentially point out the cons of *not* taking action; films may need to focus more on positive framing in order to influence decisional balance. *Just Do It* portrays several benefits of involvement in direct action campaigns: camaraderie, empowerment, and campaign successes, although some viewers will likely evaluate the cons of conflict and arrest as outweighing these pros.

In contrast to *An Inconvenient Truth* and *The Age of Stupid*, *Just Do It* takes audience acceptance of the problem for granted. This kind of film therefore appears more suitable, according to the TTM, for the kind of audience likely to voluntarily watch documentaries related to climate change, who already evidence a high level of concern (Howell, 2011). Having said that, it should be noted that Rosen (2000) found that for some health behaviours, cognitive/affective processes were used at all stages of change. He argues that when taking up healthy behaviours, individuals "must continually reinitiate a new behavior and may be helped by continuing to think about the benefits" (Rosen, 2000, p.602). Even for people who may have reached later stages of change, films such as *The Age of Stupid* can provide reinforcement and moral support (Howell, 2011), thus helping prevent 'relapse'.

In reality, climate change films are likely to be able to encourage behavioural change only to a certain extent, unless there are changes to the social context within which individuals act (Corraliza and Berenguer, 2000; Young and Middlemiss, 2012). This implies that social liberation is essential (and thus worth films promoting; Ockwell, Whitmarsh, and O'Neill (2009) propose that a particular role for climate change communications is in getting people to accept and demand regulation). Prochaska (1994) suggests that to facilitate action, the increase required in the evaluation of pros of change is so large that it may well be necessary to apply both individual change processes (to increase *perceived* pros of making a change) and policies to change the *actual* pros. One limitation of the TTM in the context of pro-environmental behaviours is that it pays little attention to the power of social norms (Schultz et al., 2007). The need to challenge dominant norms (e.g. around

consumerism) to achieve sustainability can perhaps be seen as part of social liberation, but this idea arguably needs to be developed further in the model.

6.6 Conclusions

This paper has demonstrated the potential of using the TTM to provide insights into the promotion of pro-environmental behaviour. Analysis of climate change films using the model suggests that they can play a part in encouraging individuals to take climate change mitigation action through employing and modelling several processes of change. Films are particularly suitable vehicles for consciousness-raising and dramatic relief, and therefore might most usefully promote change – which may be a change in attitudes (progression from precontemplation to contemplation, and re-evaluation of the pros and cons of change) – among viewers at earlier stages of change. The challenge is for films to attract such audiences. Embedding climate change themes in 'ordinary' movies has potential, but these should contain realistic depictions of the issue to provide accurate information, and show how 'people like me' can tackle the problem, to promote engagement and self-efficacy. Filmmakers who wish to encourage actual action, rather than early-stage progression, should consider portraying behavioural processes of change. Consciousness-raising and dramatic relief may help to reinforce behavioural change among audiences who are already taking action. However, a film on its own is unlikely to achieve significant and widespread climate change mitigation action, given the number of factors that affect behaviour, so it is advisable to consider how movies can be teamed with other interventions.

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Chapter 7: It's *not* (just) "the environment, stupid!" Values, motivations, and routes to engagement of people adopting lower-carbon lifestyles [Paper 4]

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Abstract

This exploratory mixed-methods study uses in-depth interviews to investigate the values, motivations, and routes to engagement of UK citizens who have adopted lower-carbon lifestyles. Social justice, community, frugality, and personal integrity were common themes that emerged from the transcripts. Concern about 'the environment' *per se* is not the primary motivation for most interviewees' action. Typically, they are more concerned about the plight of poorer people who will suffer from climate change. Although biospheric values are important to the participants, they tended to score altruistic values significantly higher on a survey instrument. Thus, it may not be necessary to promote biospheric values to encourage lower-carbon lifestyles. Participants' narratives of how they became engaged with climate action reveal links to human rights issues and groups as much as environmental organisations and positive experiences in nature. Some interviewees offered very broad (positive) visions of what 'a low-carbon lifestyle' means to them. This, and the fact that 'climate change' is not necessarily seen as interesting even by these highly engaged people, reveals a need for climate change mitigation campaigns to promote a holistic view of a lower-carbon future, rather than simply offering a 'to do' list to 'combat climate change'.

Keywords

Lower-carbon lifestyles; Values; Motivations; Environmentally responsible behaviour; Climate change mitigation; Pro-environmental behaviour

7.1 Introduction

> "[I]t is important to understand not only attitudes toward the environment, but also the motives and values that form the basis for those attitudes. Examining both attitudes and associated motives can lead to a better understanding of environmentally related behaviors and new ideas about ways to encourage conservation." (Thompson and Barton, 1994, p. 156)

Encouraging conservation in the huge range of individual and household-level behaviours that contribute to climate change has become an important policy goal: behavioural change with regard to home energy use, travel, and the consumption of goods and services is a significant part of the government's climate change mitigation strategy (HM Government, 2006). This paper investigates the values and motivations, and the (generally related) routes to engagement, of people who have adopted lower-carbon lifestyles, in order to determine whether these offer new ideas about how to promote such change. It includes an examination of the images and discourses such people associate with 'climate change' and 'a low-carbon lifestyle', so as to understand what concepts associated with these terms are motivational (or not).

Adopting 'a lower-carbon lifestyle' is understood here to mean making changes to one's lifestyle in order to reduce one's carbon footprint (i.e. the amount of greenhouse gases emitted by the activities comprising that lifestyle). Thus it does not necessarily mean 'having a below-average carbon footprint' (although that would be true of many of those involved in this study); 'lower-carbon' refers to individuals having a lower carbon footprint now relative to some time previously, through intentionally adopting new technologies and/or changing their behaviour.

In this paper I refer to 'environmentally responsible behaviour' (ERB), rather than using the more common term 'pro-environmental behaviour', because I shall argue that behaviours undertaken to mitigate climate change are not necessarily motivated solely or primarily by concern for 'the environment' *per se*, and thus the term 'pro-environmental' could be misleading. Although the phrase 'environmentally responsible behaviour' may share some of the connotations of 'behaviour undertaken for specifically ecocentric motives' (i.e. because of a concern about the natural world for its own sake), it perhaps does so to a lesser extent. The term is used here to refer to behaviour that seeks to reduce the negative impact of one's actions on the natural or built environment, whether or not this is done for ecocentric reasons.

After a review of relevant literature, section 7.2 details the methods and participants involved in this study. Qualitative findings relating to participants' values and motives (section 7.3) and routes to engagement with climate change (section 7.4) are followed by results of a quantitative values survey (section 7.5). Section 7.6 examines interviewees' discourses and images relating to climate change and low-carbon lifestyles; section 7.7 offers an overall discussion and conclusions.

7.1.1 Values and environmentally responsible behaviour

The term 'value' is defined here following Schwartz (1992, p.21) as "a desirable transsituational goal varying in importance, which serves as a guiding principle in the life of a person or other social entity." Values make a significant and strong contribution to the explanation of different environmental beliefs and behavioural intentions (de Groot and Steg, 2008). Value-belief-norm theory (Stern, 2000; Stern et al., 1999) posits that values are the first link in a causal chain influencing worldviews, awareness of negative consequences of behaviour, and ascription of personal responsibility for those consequences, thus activating personal norms that lead to ERB.

Schwartz's (1992, 1994) influential Value Theory posits that there are ten motivational value types, organised in two bipolar dimensions: Openness to Change *vs* Conservation (in the sense of valuing tradition and conformity), and Self-Enhancement *vs* Self-Transcendence (see Figure 18, p. 190). The poles of each dimension are opposed to each other; for example, self-enhancement values (achievement, power) are opposed to self-transcendent values (universalism, benevolence). Studies suggest that environmentally responsible attitudes and behaviour are predicted by self-transcendent values (Karp, 1996; Nordlund and Garvill, 2002; Stern and Dietz, 1994), especially those in the 'universalism' category (Schultz and Zelezny, 1999; Thøgersen and Ölander, 2002).

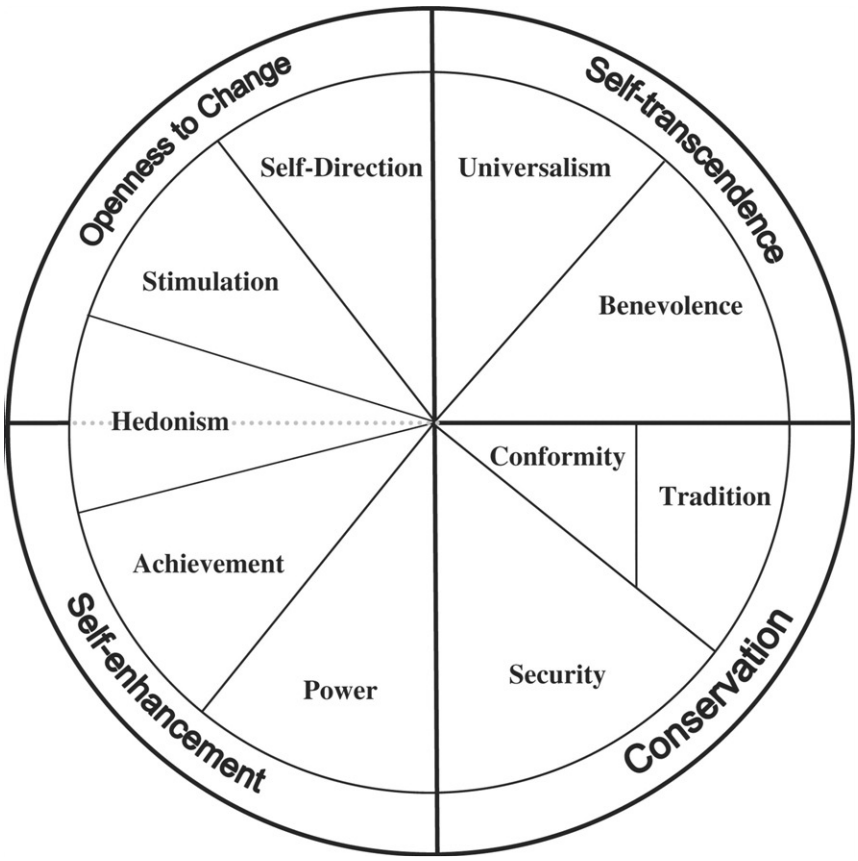

Figure 18: Schwartz Values Circumplex
Source: Davidov et al., 2008. Values and Support for Immigration: A Cross-Country Comparison, European Sociological Review, 5, 583-599. By permission of Oxford University Press.

Schwartz's 'universalism' value type includes both 'altruistic' (e.g. social justice, equality) and 'biospheric' (protecting the environment, unity with nature) items. In the 1970s, debate began over whether ERB is motivated more by a 'land ethic' (associated with biospheric values), or 'the golden rule' (altruistic values) (Dunlap and Van Liere, 1977a, b; Heberlein, 1972, 1977). Since the early 1990s, research has sought to identify whether these values can be empirically distinguished (Schultz, 2000; Stern, 2000). Karp (1996) found a biospheric value factor, which correlated with ERB, but Stern, Dietz, Kalof, and Guagnano (1995) and Stern et al. (1998) found no evidence for distinct altruistic and biospheric value orientations. More recently, de Groot and Steg (2007, 2008) have developed a survey instrument that distinguishes egoistic, altruistic, and biospheric values. They found that both altruistic and especially biospheric values positively correlate with preference for a car that scores high on environmental aspects, while people with a biospheric value

orientation express a preference for donating to environmental over humanitarian organisations and those with an altruistic value orientation express the opposite preference (de Groot and Steg, 2010).

Holding certain values does not necessarily lead to ERB; there is frequently a mismatch between the attitudes and values that people affirm, and their actual behaviour (Anable et al., 2006; Blake, 1999). This 'value-action gap' arises because many factors other than values influence behaviour, and these may constitute psychological or situational constraints on action (Gifford, 2011; Lorenzoni et al., 2007; Tanner, 1999). Everyday behaviours are often routine and habitual, making them difficult to change (Bamberg and Schmidt, 2003; Hobson, 2003; Oeuellette and Wood, 1998). But although it cannot be assumed that promoting particular values will lead to lower-carbon lifestyles, it is worth understanding the values of those who have adopted such lifestyles, as they might suggest necessary, though not sufficient, prerequisites for (voluntary) action, and conversely, could reveal that certain values are not essential antecedents of ERB.

7.1.2 Motives for environmentally responsible behaviour

When people consider particular choices, the various values that they hold can conflict, and certain values may lack salience. Therefore it is also important to consider individuals' motives for adopting ERBs. These may be multiple and complex (Moisander, 2007). There has been less research in this area than on values relating to ERB.

A motive is similar to a value in that it is a reason for action, or the goal of action, and motives and values can certainly overlap. 'Protecting the environment', for example, can be both a motive for action and the value that inspires action. The distinction between motives and values being made here is that, although at least something about a person's values may be inferred from the reasons (motives) they give for their behaviour, particularly if these are consistent across behavioural domains, the values that (they state) are most important to them are not necessarily the motives for a particular course of action. Thus we cannot assume that we understand a person's motives for specific behaviours or even general categories of behaviour (such as 'reducing consumption') by asking only about their values.

Adopting a lower-carbon lifestyle may be an example of ecological citizenship, which emphasises global, non-reciprocal responsibilities towards others as the main reason to minimise one's ecological impact (Jagers, 2009). Participants in a study of perceptions of and responses to climate change by Wolf and colleagues (Wolf, 2011; Wolf et al., 2009) shared a belief that acting to mitigate climate change is part of being a 'responsible citizen', and expressed compassion for those affected by climate change impacts. Interviewees thought they were using more than their fair share of global resources, and felt guilty about contributing to the problem. They believed that people in developing countries suffer disproportionately due to climate change; "[t]his perceived inequity in part induced the feeling of individuals' civic responsibility in the absence of political leadership on the issue" (Wolf, 2011, p. 126).

Ecocentric views also motivate ERB: studying reasons for participation in a 'green electricity' tariff, Clark et al. (2003) found that, of the motives they asked about, an ecocentric one came out top, and an altruistic one second. However, motivations for ERB extend beyond altruistic and environmental concerns. Whitmarsh (2009a) shows that some energy-saving behaviours are carried out to save money rather than to mitigate climate change, while Fujii (2006) found that, in Japan, intentions to reduce gas and electricity consumption were motivated by attitudes towards frugality (in his study, a desire to avoid wastage) rather than environmental views. Shaw and Newholm (2002), who interviewed 'voluntary simplifiers' (i.e. people who had actually reduced their consumption levels), distinguish between 'downshifters', who may be motivated by the desire for a less frenetic lifestyle rather than altruistic reasons, and 'ethical simplifiers' who exhibited wider concerns.

Some authors (e.g. De Young, 2000) maintain that we should seek to promote ERB through intrinsic (internal) motivations like pleasure or satisfaction derived from action, rather than extrinsic (external) motivations such as rewards, because intrinsic motivation leads to more energetic and persistent engagement than when action is undertaken for extrinsic motives (Crompton, 2008). Brown and Kasser (2005) show that individuals who are oriented towards intrinsic motivations engage in more ERB than others, and Chawla (1999) found that when environmentalists

were asked why they were committed to their work, it was intrinsic motivations they mentioned: a sense of integrity in living up to their values, or of competence in meeting challenges/working effectively with others. Maiteny (2002, p.305) discovered that interviewees' experiences of engaging in ERB "enhance the personal meaning of these individuals' lives, and, consequently, contribute to their sense of well-being "; Wolf (2011) also found that some of her interviewees gained considerable intrinsic satisfaction from taking action in response to climate change.

7.1.3 Routes into environmentally responsible behaviour

The main work on routes into engagement with ERB has been the study of significant life experiences leading to the development of 'environmental sensitivity', initiated by Tanner (1980). He conducted an open-ended survey among staff of US conservation organisations and found that experiences in 'natural areas' was the primary category of formative influences that led them to choose a career in conservation. Later studies (Chawla, 1998a, 1999; Corcoran, 1999; Palmer et al., 1999; Sward, 1999) have all confirmed the importance of early experiences of 'nature' or the outdoors in the formation of environmental educators and other professionals. In addition, Chawla (1999) found that concern about social justice is a distinct path into environmentalism. Hards (2012), studying individuals who self-identify as "doing something to tackle climate change", discusses the importance of a variety of transformative moments in her interviewees' narratives (e.g. having his child hospitalised triggered one participant's awareness of, and empathy for, suffering due to global problems). She also found that her interviewees often moved from valuing frugality to developing a concern about climate change (Hards, 2011b).

7.1.4 Gaps in the literature and aims of this study

Apart from the study by Hards (2011b, 2012), there is little literature on the paths by which individuals (especially those who are not environmental professionals) get involved in climate change mitigation action. As Seyfang (2006) states, more research is needed to understand the development of ecological citizenship. Although there is a theory of ecological citizenship (see Dobson, 2003),

there have been few empirical studies of the phenomenon in practice in the context of climate change (Wolf et al., 2009).

Most of the much more extensive literature on values and attitudes related to ERB is based on quantitative studies. These may not include all the values and motivations that are relevant to respondents. For example, Bamberg and Möser (2007) found that very few studies address the influence of 'moral norms', and questions about religious/spiritual motives are not generally included in surveys about ERB despite concern about climate change expressed by religious groups and in religious discourses (Middlemiss, 2010b; Wardekker et al., 2009), churches advocating a Lenten 'carbon fast' (Vaughan, 2009), and evidence of some correlation between Christian beliefs/churchgoing and *socially* responsible behaviour (Pepper et al., 2011). It may be that religious or personal moral norms are too complex, and too difficult to articulate, to make them easily amenable to exploration using the (often closed-question) survey format; arguably this is an example of aspects of values, meanings, and experiences that are best investigated qualitatively. In addition, quantitative data must usually be treated as factual in order to conduct statistical analyses and draw conclusions. Qualitative methods, however, are better at accessing what action *means* to interviewees, and what interpretations they give to events, which reveals information about values and motivation whether or not their accounts are entirely factually correct, so the historical accuracy of the data is less important (White et al., 2010).

The aim of this study, therefore, was to understand how participants became engaged in lower-carbon lifestyles, and the full range of values, visions, and motivations that inspire their action, through examining what their discourses and stories show is important to them.

7.2 Method and participants

This paper draws mainly on detailed interviews conducted in the UK between March and June 2011 with 16 individuals who self-identified as deliberately trying to live a lower-carbon lifestyle because of concern about climate change. Interviewees were recruited through two Carbon Rationing Action Groups (CRAGs); Cambridge Carbon Footprint, an organisation that runs 'Carbon Conversations' courses; and

contacts gained from earlier research among viewers of a climate change film. The sample size was deliberately small, as is common with narrative enquiry (Chase, 2005); the aim was not to produce generalisable results but to explore participants' views and experiences in much greater depth than can be achieved through quantitative methods. I carried out purposive sampling to ensure that a diverse range of participants was included in terms of factors that might affect concern/action, such as gender, age, ethnicity/country of origin, household composition and home ownership (see Table 19, below). They were all university-educated, which broadly reflects the composition of the UK climate action movement; concern about environmental issues is frequently correlated with higher levels of education (Diamantopoulos et al., 2003), and in the UK a far greater proportion of members of environmental organisations hold a degree than non-members (Ray et al., 2003). Participants lived in Scotland or England in three different major cities, two smaller university cities, a town, and a village near one of the cities. Each was offered £20 for their time.

Table 19: Characteristics of interviewees

	No. of interviewees
Gender	
Female	9
Male	7
Age	
18–34	4
35–54	7
55+	5
Ethnicity	
White British	12
White other	2
English/Chinese	1
Indian	1
Home ownership	
Owner-occupiers	12
Renting	4
Household composition	
Sole occupant	5
Couple living without children	3
Family including children at home	5
Sharing with unrelated (adult) others	3

The interviews were conducted face-to-face in a place to suit the interviewee; they were semi-structured, taking in part a narrative approach (Hards, 2012) with open questions inviting participants to tell the stories of how their concern about climate change, and whichever one or two of their emissions-reducing actions they wished to focus on in the interview, had developed. This method was appropriate because it is a holistic, contextual approach that understands ERB as dynamic, and allows interviewees to relate what *they* see as important in the development of their attitudes and behaviour. Later questions were more specific, probing issues such as interviewees' beliefs about the effects of their action, and their involvement in climate action/campaigning groups. Participants were also asked what images came to mind when I said "climate change" and then "a low-carbon lifestyle", and what their feelings about these images were. After covering the main topics, I changed the style of the interview from one in which I had said relatively little, to make it more of a conversation: offering more information about my own position and the kinds of questions I aimed to explore through the research, and feeding back to each interviewee some reflections on what they had said, inviting their comments. This was in part a response to pilot interviews I conducted, during which I found that conversations afterwards about what had been discussed clarified or revealed further information; in part to check whether my interpretation of some of what had been said was accepted by the interviewee. At the end of each interview, participants were asked if anything we had covered stood out as particularly important to them; this is useful for analysis because it helps to distinguish what is important from what has been frequently mentioned, which may not be the same thing (Krueger, 1998; Morgan, 1997). These were in-depth conversations; the average interview length was an hour and 41 minutes.

The interviews were recorded, transcribed, and coded using NVivo software. Some simple descriptive coding themes were pre-determined from the interview questions (e.g. codes identifying 'feelings', 'images' or 'action'), but most codes were developed through an inductive process of reading and re-reading the transcripts, identifying recurring words and themes within and between interviews, and grouping the codes thus generated into collections of similar content, identifying concepts such as 'values'. This is a technique borrowed from grounded theory

(Glaser and Strauss, 1967), which allows hypotheses about, and answers to, questions such as "what motivates people who have adopted lower-carbon lifestyles?" to be formulated from the data, rather than beginning with hypotheses to be tested.

Quantitative data were also collected. Interviewees who had calculated their carbon footprint were asked to provide this information; six did not have any data, and as the focus of the research was on stories of change rather than on quantifying interviewees' emissions or emissions reductions, they were not asked to complete a carbon footprint calculation.

Four months after all the interviews were completed I emailed participants a simple online survey designed to assess their egoistic, altruistic, and biospheric value orientations, in order to test the hypothesis, developed during interview data analysis, that interviewees would score altruistic values more highly than biospheric values (and both more highly than egoistic values). The survey instrument was designed by de Groot and Steg (2007, 2008) based on Schwartz's Value Theory (1992, 1994), to measure value orientations related to environmental behaviour. The survey instrument consists of five egoistic values, four altruistic values, and four biospheric values (see Table 20, p. 204). Participants were asked to rate the importance of each value "as a guiding principle in your life" on a 9-point scale from –1 (*opposed to my values*), 0 (*not important*), 3 (important), to 7 (*of supreme importance*). Following de Groot and Steg (2007, 2008), they were encouraged to score not more than two values at 7 and to distinguish as much as possible between values by varying scores.

7.3 Interviewees' values and motives relating to climate change mitigation

In the presentation that follows of significant themes that emerged from the interviews, all names given are pseudonyms. I discuss here both the implicit and explicit motivations for action that emerged from interviewees' accounts, and the values that are implied by their discourses and concerns (later tested explicitly using a questionnaire; see section 7.5). I do not attempt in this section to make a sharp distinction between values and motives (since they can overlap); the approach was to consider what reasons interviewees gave for action, and how they framed and

expressed their stories, inferring from these data what participants value (discussed in the conversational, feedback part of most interviews).

7.3.1 Social justice: "Is it possible for us to live in a fair way?" (Sally)

One of the themes that emerged most frequently (coded in 14 transcripts) was labelled 'social justice'. This incorporates several related aspects, including concern about poorer others, and concepts of (un)fairness, human rights, 'needs', and societal well-being.

Concern about the negative impacts of climate change on poor people (in developing countries) was widespread among interviewees. For many, climate change is an issue of justice because those who will (and do) suffer most "had no part in creating the problem" (Ben); instead responsibility lies with 'us': "We are *stealing* from the poor, and we are *killing* them with our indulgence!" (Em). This view creates a sense that "it is *deeply* unfair that parts of the world are going to *suffer* because of our *needless* consumption and unthinkingness" (Claire). This unfairness is not necessarily only rooted in heedless or selfish behaviour, however. Sally argued that "Even if you or I live as low-carbon as we can, we're still using a massive proportion of the world's resources compared to people in many other countries, and is it possible for us to live in a fair way?" Implicit in these discourses is the idea of a 'fair share' of resources and greenhouse gas emissions, made explicit by Em: "At one point I had this potential plan to get my personal emissions down to about the world average […] then I wouldn't be taking *too* much more than my share."

Thus interviewees' concern and action was often motivated by concerns about people, more than (or as well as) 'the environment', or 'nature'. Aileen makes this explicit: "I think sometimes people don't make that connection to do with poverty. They think of it just more about the environment per se rather than the actual impact on people." This is not to say that environmental concerns did not play a part; four interviewees mentioned distress about species loss and they and others expressed concern at potential damage to landscapes and about humans' perceived lack of connection to the natural world. For some, though, this had developed later than, or as a result of, their concern for people, and although interviewees tended to see 'humans' and 'the environment' as fundamentally interconnected, most (though

not all) agreed that it was the potential for human suffering that was the strongest driver for their action to mitigate climate change. If climate change were somehow only to impact non-human nature, without any adverse consequences for humans, several interviewees said that it would be unlikely to be such a concern for them.

7.3.2 Community: "I think this has to do with being linked into the community" (Ian)

Another people-related theme that emerged from the data, although from far fewer transcripts than the social justice theme, was 'community'. This theme is about a sense of connection to others, and a feeling of responsibility or desire to be helpful, that both grows from that sense of connection, and strengthens it. It thus shares some features of the social justice theme (e.g. responsibility to others), but differs from it in emphasising action because of the feeling of connection to others – especially at a *local* scale, as well as globally – rather than because of notions of justice.

When asked about the reasons for reducing her carbon footprint, Prue included "a feeling of being part of the community" of her village, and later spoke of being "one tiny part of a large world community doing your bit." Luke's response to the same question was: "I see myself as an active participant in the community, and I see trying to live a lower-carbon lifestyle as something that is helpful to the community as a whole." As part of his story of taking action, Ethan explained, "I feel I'm *everyone's* keeper and everyone else is mine and we're all on this boat together."

A sense of community was also seen by some as a positive outcome of action: for example, Ethan said, "you gain something emotionally by doing what you believe in and […] feeling connected", while Deepta included community living as a positive image associated with 'a low-carbon lifestyle' for her. She also regarded community as a very important part of finding solutions, because "if you're in an environment where there's a bunch of people and you're bouncing ideas off each other that's where you get the creativity, that's where you get the brilliant new idea. You don't get that sat on your own in a room." Paul mentioned the sense of community built among people involved in Carbon Conversations groups; he regarded the opportunity for people to talk one-to-one in these groups, helping to support each other in facing the challenge of climate change, as one of the most important aspects of them.

7.3.3 Frugality: "There's no desperation for new trainers" (Ethan)

A third theme, which emerged from ten of the interviews, was labelled 'frugality'. This encompasses several elements, including self-perception, behaviours/practices, and beliefs about consumption and happiness. Interviewees characterised themselves as "frugal", "thrifty", "anti-consumerist", "not materialistic", "abstemious", and even "mean". They detailed practices such as buying second-hand clothes and other goods, not buying a lot of 'stuff', and not spending time or money on personal appearance. Although often mentioned as part of a list of actions that make up their lower-carbon lifestyle, interviewees typically explained that frugal practices pre-dated climate change concerns. Luke, for example, said: "I'm conscious in the home of energy usage – only when it needs to be used. Lights, showers, showers instead of baths, using less water – but that seems to be something that I just had drummed into me from an early age anyway." Furthermore, these are practices that feel very comfortable and natural; they are not difficult or experienced as privation. Em explained, "I don't really have that much of a need to buy stuff or an urge to buy stuff. I'm quite happy wandering around in old clothes, so it's very easy for me to be contented with a lifestyle in which I buy second-hand clothes and things", while Ethan connected the "tranquil" atmosphere in his home to the fact that "there's not a lot of pressure to consume".

This positive valuation of frugality, or 'simple living', and rejection of materialism/consumerism had a variety of origins. For some interviewees (of all ages) it was part of their upbringing, whereas Claire stated several times that she was "by nature" a frugal person and did not know where that had come from as it was not how she'd been raised. Evie's Christian faith is a strong influence on her values; she stated that if everyone followed Jesus "we'd all not really own very much".

A common idea among the participants was that consumerism does not lead to happiness and may indeed be harmful to individuals directly, as well as through creating/compounding environmental problems. Eszther agreed with what she'd read that "easy access to all kinds of consumables might have a detrimental effect on children", while David characterised consumption negatively as "like a drug". He suggested that "We *can* do with a lot less and just get used to it bit by bit *and* be quite content with it." Others had a perhaps more utopian vision: "The only thing we

need to do is realise that we live in an age of sufficiency and to embrace it instead of wanting more" (Ethan), while Deepta enthused, "If we stopped buying stuff and didn't feel like we needed lots of useless things, we would just be so much happier. We'd have so much more free time, we'd have family and friends that we would genuinely be close to and lived with properly."

7.3.4 Personal integrity: "I want to live a moral life" (Em)

A final, overarching theme was coded 'personal integrity'. This links the other three; people will feel a sense of personal integrity when acting in accordance with their values of social justice, community, or frugality. It is included here as a separate theme in order to explicitly draw attention to the importance of personal integrity to the interviewees, because it was clear that they felt a desire/commitment to live "the way it feels right" (Ben) simply because it is right, whether or not this achieves other aims such as social justice or environmental protection. For example, Ian said, "It's just something that I feel is the right thing to do so I don't look at [whether it makes a difference] much greater than that" and Em explained:

> …in some ways individual behaviour is to some extent futile. But I still feel like – I suppose in that way it's similar to my veganism and everything else – that I'm not going to be an active part of this. Even if that doesn't stop it I still feel an obligation to... It's hard to express [Laughs] and I'm not sure if it makes that much sense to other people, but to say, "even if this has no impact on the great scheme of things, in my behaviour I'm not going to be an active participant in this."

This is 'virtue ethics' rather than consequentialism, i.e. being concerned to maintain one's moral character rather than judging the worth or rightness of one's actions by their consequences. Asked why she takes action even when others don't, Aileen replied "I think that's all you can do is try and be faithful to whatever you think's right yourself", while George said "I try and be honest." Doing what is right makes interviewees feel "comfortable" in themselves (Ian, Em); Deepta said that "If I wasn't doing it, then I just wouldn't be happy. I feel so unhappy with the way the world is that I just couldn't possibly not try." This latter statement was echoed by others who felt "I couldn't not do it" (Paul) or who characterised their action as something they simply had to do whatever others were (not) doing.

7.4 Routes to engagement with climate change and lower-carbon lifestyles

Interviewees' narratives of change revealed various routes to their lower-carbon lifestyles. Concern about other social justice and human rights issues (which tended to be long-standing) led some interviewees to engagement with climate change. For example, Sally explained that she had realised that "because of climate change all the things we've tried to achieve in […] women's rights in developing countries especially, that would all just fall apart – and was already beginning to fall apart, because of climate change. It was probably actually feminism which brought me into climate change". Deepta stated, "My path to environmentalism was, I was really into human rights." Many of her friends in her university Amnesty International group were also involved in environmental campaigns and this led to Deepta becoming involved too. David related his concern to growing up in South Africa, because "you really had to have a view about what you thought of race discrimination and so on" and this led to political and social awareness that developed into concerns about many issues, including climate change.

For Ian, the pathway to action was a local anti-road campaign (which he characterised as a local community issue, rather than an environmental one): "that's how I got involved in Friends of the Earth, and I think once you start getting involved in community stuff – and I'm still heavily involved in local community stuff – so I think you become much more […] socially responsible."

When asked whether there was "any kind of spiritual/religious/humanist basis" for their concerns, seven interviewees mentioned the influence of their Christian upbringing, even though they did not necessarily consider themselves 'religious'. Luke, for example, said that going to church as a child "has given me a kind of moral compass", while Ben considered that "just the predisposition of being brought up in a Christian household with the whole considering your own guilt and your own responsibility, or how you're going to deal with your impact, I think that's really huge". In some cases it was clear that there was a dynamic relationship between interviewees' spirituality/religious convictions and their concerns about climate change. Aileen explained that when she first started to reduce her car use "I didn't really think of it in Christian terms at all" but "*now* I would see that as very much

part of what it means to be Christian". Em regarded her moral standards, which drive her climate mitigation action, as having come from her upbringing as a Baptist; she had converted to Judaism as an adult and interpreted a Jewish law about avoiding waste according to her carbon footprint minimisation ethics. In a two-way synergy, she viewed Jewish principles as "feed[ing] into my environmentalism", and her understanding of these principles was also shaped by her prior altruistic values.

Similarly, engagement with climate change sometimes entailed developments in interviewees' worldviews. Deepta explained that originally "I very much felt like, 'oh human beings are more important than the environment' whereas now I'd never make that categorisation because I don't really think of them as separate issues."

Interviewees' narratives generally implied stable values underlying, and motives for, their actions, linking different activities that were inspired by similar factors. Prue, for example, compared the enabling role of Carbon Conversations groups to her professional interest in enabling people to manage chronic health conditions for themselves. This in turn had developed when she did voluntary work in Africa and discovered that she was good at facilitating people to bring about changes in their community (which experience also increased her awareness of the vulnerability of poor nations to climate change). However, Paul's values had changed over time. He considered himself as having been "pretty materialistic" in his teens but had realised that it wasn't making him happy and so rejected that lifestyle; he regarded his engagement with climate change as an outcome of a process of searching for greater meaning in life.

7.5 Results of the values questionnaire

Fifteen of the 16 interviewees completed the values questionnaire (one person could not be contacted by the time the survey was administered). Cronbach's alpha (a measure of the internal consistency, and therefore reliability, of the scores obtained from a survey instrument) for the altruistic and biospheric value scales was good, at .81 and .87 respectively; for the five egoistic value items it was only .41, but removing the item 'ambitious' from the scale increased alpha to .63, and therefore this item was excluded from analysis. Table 20 (p. 204) shows the total and mean

score for each value when all 15 responses are combined; the highest ranked value was 'social justice'.

Table 20: Value scores totalled for all respondents (*n* = 15)

Value and definition used in the survey	Rank	Total score (max = 105)	Mean score
Altruistic values			
SOCIAL JUSTICE (correcting injustice, care for the weak)	1	84	5.60
EQUALITY (equal opportunity for all)	2	81	5.40
HELPFUL (working for the welfare of others)	4=	76	5.07
A WORLD AT PEACE (free of war and conflict)	4=	76	5.07
Biospheric values			
PROTECTING THE ENVIRONMENT (preserving nature)	3	79	5.27
RESPECTING THE EARTH (harmony with other species)	6	72	4.80
PREVENTING POLLUTION (protecting natural resources)	7	71	4.73
UNITY WITH NATURE (fitting into nature)	8	57	3.80
Egoistic values[a]			
INFLUENTIAL (having an impact on people and events)	9	47	3.13
WEALTH (material possessions, money)	10	19	1.27
AUTHORITY (the right to lead or command)	11	12	0.80
SOCIAL POWER (control over others, dominance)	12	5	0.33

Note: Schwartz's Value Survey (1992, 1994), on which this instrument is based, deliberately included some items expressed as nouns and others as adjectives.
[a] A fifth egoistic value item, AMBITIOUS (hard-working, aspiring), was originally included, but did not correlate well with the other items in this scale.

Examining each individual's responses revealed that twelve interviewees scored higher on the altruistic values scale than the biospheric values scale; one had equal scores for both. All respondents scored lowest on the egoistic values scale. A repeated measures analysis of variance determined that individuals' scores for the three value orientations differed significantly ($F(2, 24) = 69.809$, $p < 0.0005$). Post hoc pairwise *t*-tests (one-tailed) confirmed the hypotheses that participants rated altruistic values more highly than biospheric values as the 'guiding principles' of their lives ($p = 0.020$), and both altruistic and biospheric values as more important than egoistic values ($p < 0.0005$ in each case). As this is a closed testing procedure (Marcus et al., 1976) there is no need to apply a correction for multiple testing (Bender and Lange, 2001).

7.6 Discourses and images related to 'climate change' and 'a low-carbon lifestyle'

As might be expected, the images interviewees associated with 'climate change' were generally negative, and, in common with the findings of Lorenzoni et al (2006), tended to focus on impacts rather than causes or solutions. However, a few of the discourses raised surprising points. Ben finds the phrase 'climate change' irritating, because it is overused: "I think it's become a cliché and it's almost its own worst enemy." He said he no longer has conversations about climate change; "it provides the background really to conversations, rather than the immediate subject." Later, despite still being committed to the CRAG he belongs to, he said, "I don't really want to talk about carbon at all these days." However, he does have many conversations about energy, and when asked why people are interested in talking about energy he said he thought it was "related to the debates around peak oil and whether it's going to hit us or not". So for Ben, who used to have lots of "frantic climate conversations", the debate has moved on; climate change has become "mainstream"; at the same time, he thought that people also avoided talking about it because they feel "I don't really want to go there because it doesn't cheer me up".

Paul, who volunteers as a facilitator of Carbon Conversations, said "I find that even just saying 'climate change' turns people off"; he avoids talking about the problems of climate change and consumerism (as he sees them) in favour of "bring[ing] it to the personal", and giving a positive message about the benefits he's reaped from the action he's taken. He explained "that's not in my nature, is to make people feel uncomfortable about it. So that's why I go on to the other side of it, trying to talk about the solutions without even talking about the problem."

Deepta is heavily involved in an organisation promoting action to mitigate climate change, yet she asserted, "I'm not that interested in [climate change] as a person. As I said, I don't think it's actually that relevant and I think in some ways it can be unhelpful because it becomes this thing which we either believe in or don't, or care about or don't. It fosters that view of, 'it's something that we have to do because we're destroying the planet' [spoken in a gloomy tone], not because we genuinely want something that's better." She takes the view that "You don't even have to

believe; you can be a climate change sceptic and you can think that it's all a lie and still think that a low-carbon lifestyle is better."

So what does a low-carbon lifestyle mean to these early adopters? When asked what images the phrase brought to mind, nine interviewees responded (in whole or part) with specific activities, or things to have (such as insulation) – or, more usually, to do without:

> No car. Garden. As few electrical things as possible (Hazel)
>
> You try and do without a car, you rely on public transport. (George)
>
> Less buying. And more planning. (Eszther)

In general, these images were associated with positive feelings, although Ian regarded a low-carbon lifestyle as "limiting", but "only slightly negative" because his friends share his views, while David reluctantly believed that such a lifestyle "has to be sold." However, some interviewees gave answers that were rather less tangible and concrete:

> For me it's more local living, stronger communities, more time for each other […] a less materialistic lifestyle where we don't need to have so much and hopefully meaning that we don't need to work so much and have more free time. (Paul)
>
> Somehow I see sunshine. Yeah, lightness actually. Brightness and a sort of small place to live. Green grass and everything bright. There's something healthy about that. Healthy and wholesome I suppose. (Aileen)
>
> Living really close to nature. I think that is the most dominant one. That's the one that makes me happy and that's the one that makes me inspired. […] I think communities is another one. Connections with nature and community living and all the – I do have to remind myself that it wouldn't solve every single problem and life wouldn't be perfect. [Laughs] (Deepta)

These are not images that would translate into 'carbon reductions per year' or any quantifiable measure; rather, they show that "lower-carbon lifestyles" are associated, at least for some activists, with a much broader vision of 'the good life', and benefits such as health, wholesomeness, and community. This also seems to be true for some of the participants who answered with the more typical list, such as Claire, who regarded the prospect of fewer cars on the streets as "lovely" because people would interact and not have to worry about traffic, and Prue, who repeatedly stressed the satisfaction she gains from cycling ("it's not only that you are not using resources, but you see a neighbour and you stop and say hello in a way you don't when you use the car") and buying local produce ("you are eating healthily, and you're saving money"). Several interviewees referred to their visions as 'idyllic' or similar, and recognised, like Deepta in the quote above, that the reality might not be

quite so "perfect", but these were very attractive images and Aileen did not seem to be the only participant who believes that "it's probably much more possible than we think."

It is possible that interviewees' discourses, images, and motivations for action have been shaped to some extent by common or shared sources. For example, seven of the participants had worked through the Carbon Conversations course book (Randall, 2009), though not together. Three interviewees belonged to the same Carbon Rationing Action group, and two to another, so they knew each other and would have shared conversations; one CRAG member explicitly mentioned another as a 'resource'. Two interviewees talked about having been to Climate Camp. When asked about sources of information that they used, 3–5 interviewees in each case referred to the internet; campaign organisations; newspapers, especially *The Guardian*; and scientific reports, including those of the Intergovernmental Panel on Climate Change. Books were also mentioned, especially *Sustainable Energy Without the Hot Air* (MacKay, 2009).

7.7 Discussion and conclusions

These findings suggest some clear themes for further research, and potential consideration by policymakers and practitioners who wish to promote lower-carbon lifestyles.

First, it is clear that concern about 'the environment' or 'nature' *per se* is not the primary motivation for most interviewees' action to mitigate climate change. Contrary to some popular perceptions, these 'early-adopters', most of whom are quite radical in the level of action they have taken, are not, in general, 'deep green' environmentalists concerned above all with the welfare of non-human nature. Typically, they are more concerned about the plight of poorer people who will suffer from climate change (cf. Wolf, 2011; Wolf et al., 2009). 'Community' is also a motivating factor, and views on the benefits to humans of a 'low-carbon lifestyle' come across clearly.

These data were triangulated by comparing interview transcript analyses with the results of the values questionnaire administered to participants. These show that, although biospheric values are important to interviewees, and the item 'protecting the

environment' received a total score higher than two of the altruistic values ('helpful' and 'a world at peace'), participants tended to score altruistic values significantly higher than biospheric ones. Thus, it may not be necessary to promote biospheric values or an ecocentric worldview, as advocated for example by Thompson and Barton (1994) and de Groot and Steg (2010), to promote lower-carbon lifestyles.

Motivations and values associated specifically with mitigating climate change may differ from those related to other or more general ERB, studied by these researchers, for various reasons. Arguably, climate change impacts more obviously and extensively on humanity, and/or is more clearly inequitable in terms of both causes and outcomes, than some other environmental issues (such as species extinctions or local pollution problems), which attract attention for different reasons. If I had sought to recruit interviewees through traditional environmental campaign groups and conservation organisations I might have found more people living lower-carbon lifestyles with a primarily biospheric value orientation. However, for action that is specifically climate change-related, altruistic values seem just as 'useful', and if they are held more strongly than biospheric values by the general population, climate change communications might do better to frame the issue as one of social justice than environmental protection, highlighting impacts on people – especially poorer and disadvantaged people, such as women, who are disproportionately impacted by climate change (Denton, 2002). Such messages may not promote change, due to the value-action gap (Anable et al., 2006; Blake, 1999), and the need for facilitating conditions and removal of barriers to action (Lorenzoni et al., 2007). Moreover, some people find it easier to relate to more local impacts (O'Neill and Hulme, 2009), or may have other values that are stronger than altruistic ones. The point is that, although we cannot be confident of their efficacy, altruistically-based appeals may have more effect than ecocentric ones.

Similarly, participants' narratives of how they became engaged in climate action reveal links to human rights issues and groups as much as environmental organisations and positive experiences in nature. It seems that the specific problem of climate change mitigation is attracting people who have different concerns and motivations from the environmental professionals who have most often been surveyed in research on significant life experiences that lead to environmental

sensitivity (e.g. Chawla, 1999; Corcoran, 1999; Palmer et al., 1999). This suggests that those who wish to promote lower-carbon lifestyles may find it fruitful to work with human rights and development groups, and with organisations that place emphasis on altruistic values, such as many religious groups. Development charities such as Oxfam and Christian Aid are already campaigning on climate change, but more could be done to make links between the concerns of organisations promoting women's, children's, and refugees' rights/welfare and the potential impacts of climate change on these groups.

The discovery that frugality was an important value for interviewees, and one that pre-dated concerns about climate change, echoes the findings of Hards (2011b) and Fujii (2006). The positive valuation of frugality by interviewees was confirmed by the results of the values questionnaire, showing that 'wealth' was not generally considered important by them. These findings suggest that people with a preference for frugality are likely to find it easier and more appealing than others to reduce their carbon footprint (although this study cannot show whether and why there might be such people who are not taking action). Thus a long-term strategy for promoting lower-carbon lifestyles might need to involve promoting the value of frugality, and curtailing activities such as advertising that promote materialistic values (Kasser, 2011). Messages that stress the social justice and community benefits of mitigating climate change might be beneficial because as well as being people-centred, they help to enhance the salience of self-transcendent values such as being responsible and helpful, and reduce the salience of self-enhancing, egoistic values such as wealth and status (Corner and Randall, 2011).

These interviewees held strong intrinsic motives for their lower-carbon lifestyles. The 'personal integrity' theme makes this most explicit, but all the themes discussed reveal that the participants were not generally (and certainly not primarily or solely) acting for external rewards. This echoes the findings of Chawla (1999) that a sense of integrity and of living up to personal values motivated environmentalists to carry on their work when they felt like giving up, as well as comments by participants in the study by Wolf (2011).

Participants generally found that adopting lower-carbon lifestyles was rewarding and offered benefits in addition to the satisfaction of acting on personal

values (cf. Osbaldiston and Sheldon, 2003, who distinguish between 'identified' and 'intrinsic' motivations, the former being about endorsing values, the latter involving finding behaviour challenging and enjoyable). These findings are similar to those of Maiteny (2002), and of Brown and Kasser (2005), who found that intrinsic values were associated with subjective well-being as well as ERB. They also support De Young's (2000) suggestion that intrinsic satisfactions that are useful for ERB can be derived from frugal behaviours and from participation in a community, nicely drawing together several themes that emerged from this study.

This point about well-being and satisfaction is further illustrated by the positive visions associated with lower-carbon lifestyles that some interviewees offered. They clearly regard such a future as offering many benefits, both specific and less tangible. Kaplan (2000) argues that appealing to altruism to promote ERB is not motivating because it suggests sacrifice and is joyless, but many of these study participants seem to experience both strong altruistic motivations for action and positive affect from taking action and envisaging further benefits to be gained from 'a low-carbon lifestyle'. This, and the fact that 'climate change' is not necessarily seen as interesting even by these highly engaged people, reveals a need for climate change campaigns to promote a much broader, more holistic view of the benefits of a lower-carbon future, rather than offering only a 'to do' list to 'combat climate change'. Although people do need information on what they can do, and which actions are most effective in terms of reducing one's carbon footprint (Whitmarsh, 2009a), starting from what individuals want, such as quieter, safer streets, might engage some people in taking action more effectively than 'Ten Ways to Save the Planet' messages. This approach has been adopted by the Transition movement, which aims to use positive, empowering rhetoric, and offers multiple reasons to get involved (see Hopkins, 2008).

This research has enabled exploration of the motives, visions, and values of individuals who have adopted lower-carbon lifestyles in greater detail and depth than can be gained from quantitative studies, and offers insights gained from how interviewees present change narratives and talk about related issues, as well as from direct questions. As this was a small-scale, exploratory study, these insights should be investigated further with larger-sample studies. Obviously, these interviewees are

not representative of the general population, but if "It's the environment, stupid!" is not a catchphrase that adequately captures the range of motivations of even these committed people, the motivational approach it represents seems to be even less likely to inspire widespread behavioural changes among the general public. Climate change is a 'wicked problem' with complex social, economic, political, and ecological dimensions. This research suggests that it should not be framed merely as an 'environmental' issue by those who hope to engage the public in dealing with it.

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Chapter 8: Living with a carbon allowance: the experiences of Carbon Rationing Action Groups and implications for policy [Paper 5]

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Abstract

Carbon Rationing Action Groups (CRAGs) are grassroots voluntary groups of citizens concerned about climate change, who set themselves a carbon allowance each year and provide support to members seeking to reduce their direct carbon emissions from household energy use and personal transport. Some groups have a financial penalty for carbon emitted in excess of the ration, and systems whereby under-emitters are rewarded using the monies collected from over-emitters. CRAGs therefore operate the nearest scheme in existence to the proposed policy of Personal Carbon Trading (PCT). This paper reports the findings of a study of the opinions and experiences of individuals involved in CRAGs ('CRAGgers'). In general, interviewees have made significant behavioural changes and emissions reductions, but many would be unwilling to sell spare carbon allowances within a national PCT system. The choices made by CRAGgers with respect to the design and operation of their 'carbon accounting', their experiences of reducing fossil fuel energy use, and their views on personal carbon trading at CRAG and national level are discussed. Some possible implications for PCT and other policies are considered, as well as the limitations of CRAGs in informing an understanding of the potential impacts and operation of PCT.

Keywords

Carbon allowances; Personal carbon trading; Carbon Rationing Action Groups

8.1 Introduction

The UK government's 2007 energy white paper attributes 42% of UK carbon dioxide (CO_2) emissions directly to individuals, through their use of energy in the home and for personal transport (DTI, 2007). Significant reductions must be made in household-level fossil fuel energy use if the government's target of an 80% cut in UK greenhouse emissions by 2050 is to be met. Personal Carbon Trading (PCT) has been proposed as a policy to facilitate this (Fleming, 2007; Hillman and Fawcett, 2004). PCT would involve giving individuals carbon emissions allowances, and would operate as a 'cap and trade' system, analogous to the EU Emissions Trading Scheme (EU-ETS) operating in the industrial sector.

The Sustainable Development Commission has repeatedly recommended PCT to the UK government (SDC, 2005a, b, 2006), and David Miliband was favourable towards investigating the idea while Secretary of State for the Environment (Miliband, 2006). An early study concluded that PCT would be technically viable (Starkey and Anderson, 2005). As a result of its 'pre-feasibility study' of PCT, the Department for Environment, Food and Rural Affairs (Defra) concluded that the concept "is currently ahead of its time"; nevertheless, the report recognised that "there may be circumstances in the future where personal carbon trading is a cost effective and desirable policy option" (Defra, 2008b, p. 21). The House of Commons Environmental Audit Committee published a report on PCT that was much more positive about the concept (EAC, 2008), and the Institute for Public Policy Research argues that policymakers should keep the option open for the future, in case other policies fail to deliver the necessary emissions reductions (Bird and Lockwood, 2009). It has so far proven difficult to engage the public in significant energy-related behavioural changes despite concern about climate change: 37% of respondents in a recent study say they are not doing anything to tackle climate change, despite 82% reporting feeling 'very' or 'fairly' concerned (Downing and Ballantyne, 2007).

There are important issues to consider regarding the ability of individuals to engage with PCT, such as whether they would be able to understand a carbon allowance and budget their fossil fuel energy use, whether they would be able to reduce their emissions significantly if they wish to, and whether they would be willing and able to trade in carbon credits. Work on the potential for trialling PCT

concluded that a trial that could meaningfully attempt to explore any of these questions could cost between £500,000 and £950,000 and take between 2.5 and 3 years (Fawcett et al., 2007). However, there exists in the UK a movement of grassroots Carbon Rationing Action Groups (CRAGs) that, in theory at least, operate (on a voluntary basis) the nearest scheme in existence to PCT. The study reported here was therefore designed to learn about the functioning of CRAGs and the experiences and opinions of individuals involved, and to determine whether (and to what extent) these could offer any insights into the potential operation, impacts, and design considerations of a compulsory PCT policy.

8.2 Personal carbon trading

Two main variants of a PCT scheme have been considered by the UK government: Domestic Tradable Quotas (DTQs), first proposed by Fleming (1996, 1997), who later referred to them as Tradable Energy Quotas (Fleming, 2007), and an alternative referred to as carbon rationing or Personal Carbon Allowances (Fawcett, 2004; Hillman, 1998; Hillman and Fawcett, 2004)[5]. Bottrill (2006a) provides a summary of these proposals, and the variations between them. In essence the two schemes are similar, and throughout this paper the term 'PCT' is used to mean any system of tradable carbon allowances allocated free to individuals to cover their direct energy use (home energy and personal transport). The allowances would decrease by publicised increments over the years, in order to meet stated emissions reduction targets.

8.2.1 Receiving, using, and trading carbon allowances

Every eligible adult would have a 'carbon account' (and associated 'carbon card'), similar to, and perhaps linked with, a bank account, which would be automatically credited with their free carbon allowance (composed of 'carbon credits') at regular intervals. Parents might receive an extra allowance for children

[5] Note that other variants have been proposed; see Fawcett and Parag (2010) and Eyre (2010) for details.

(Fawcett, 2004), or else the existing child benefit system could be used to compensate parents (Fleming, 2007).

Fossil fuels (principally gas, oil, coal, petrol, and diesel), electricity generated from non-renewable sources, and possibly travel tickets would be assigned a carbon rating, based on the amount of CO_2 emitted using these goods. Individuals would be required to surrender the rated carbon credits for these purchases, as well as monetary payment.

Carbon credits would be legally tradable between individuals. Those with spare credits could sell them on a regulated market to individuals who required more than their free allocation. This is an important aspect of PCT, since the allowance necessary to cover current CO_2 emissions varies considerably between individuals – a study of 40 people revealed that their annual emissions differed by a factor of 12 (Keay-Bright and Fawcett, 2005). It would also provide an incentive for individuals to cut their emissions below the allowance level, which would not exist if they could not sell spare credits.

Individuals would be able to check their carbon accounts and buy or sell credits at post offices and banks, by phone, or using the internet. They would also be able to buy carbon credits at point-of-sale when purchasing carbon-rated fuels and travel tickets. (Note that these are the only goods that would be carbon-rated, as PCT schemes are not designed to cover 'embedded' emissions in products such as food and clothes.)

8.2.2 Existing research

Fawcett (2010) provides a comprehensive overview of research into PCT. I mention here that which is particularly relevant to a consideration of the effects on an individual of having a carbon allowance.

Capstick and Lewis (2008) provide an overview of perspectives from psychology and behavioural economics relating to the theoretical effects that PCT might have on social norms and personal behaviour. They then used a computer simulation to investigate respondents' energy-use choices in response to an allowance (Capstick and Lewis, 2010). Wallace et al. (2010) and Parag et al. (2011) employed questionnaires to discover whether and how respondents expected they

would change their behaviour in response to PCT. These studies provide a useful indication of 'first responses' to PCT across a variety of respondents; the value of interviewing CRAGgers is that we can learn from their longer-term engagement with the issues around PCT, and their lived experiences of carbon budgeting, reducing emissions, and – in some cases – buying or selling carbon credits.

Other work has considered the knowledge and skills required to understand and budget for carbon emissions (Parag and Strickland, 2009; Whitmarsh et al., 2009). Whitmarsh et al. (2009) suggest that there are currently low levels of 'carbon capability' among the UK population. Seyfang (2007) considers lessons for PCT from the operation of complementary currencies (such as LETS); she found that the skills and capabilities of participants was one of five factors critical for the success of such schemes.

8.3 Carbon Rationing Action Groups

8.3.1 History [6]

Andy Ross first articulated the idea of forming local carbon rationing groups after the climate change march in London in December 2005, inspired by George Monbiot's speech calling for 90% emissions cuts by 2030 (Monbiot, 2005; see also Monbiot, 2006), and influenced by Hillman and Fawcett's (2004) proposal for carbon rationing. Ross published his draft proposal on the Campaign against Climate Change website later that month (Ross, 2005). Following this, CRAGs were formed in Oxford, Leamington and Hereford in the first half of 2006 by Ross and other concerned citizens. There are now (December 2010) 21 groups listed on the website as 'active' in the UK (see 8.3.3).

8.3.2 Aims and principles of the movement

In *CRAGs: a short guide*, Ross (2006) set out details of how he envisaged the groups would operate. The stated aims were as follows:

1. To make us all aware of our personal CO_2 footprint
2. To find out if it can help us make radical cuts in our personal CO_2 emissions

[6] For full details of the movement's history, see http://www.carbonrationing.org.uk/wiki/how-did-crags-get-started? and http://www.carbonrationing.org.uk/wiki/crags-chronology?

3. To help us argue for (or against!) the adoption of similar schemes at a national (DTQ) and/or international (C&C) [Contraction and Convergence] level
4. To build up solidarity between a growing community of carbon conscious people
5. To share practical lower-carbon-living knowledge and experience.

The *Guide* envisaged that each CRAG would agree a fixed, equal-per-capita ration for members' CO_2 emissions for the 'carbon year', and would have a 'carbon accountant' to whom members would regularly send details of energy usage in order for their emissions to be calculated using agreed conversion factors. It was suggested that only home energy use, travel by private vehicle, and flights should be accounted for, for the sake of simplicity. Household emissions would be divided by the number of members of the household, whatever their age (in other words, children would get a full carbon allowance), but vehicle emissions would be deducted solely from the owner's ration, again in order to keep the scheme simple. Each CRAG was advised to agree on its own price per kilogram for CO_2 emitted over the ration for the year, to be paid by over-emitters into a 'carbon fund', and to determine how the funds would be distributed. Carbon trading was not assumed: suggestions for use of the carbon fund included giving it to under-emitters in proportion to their share of the total savings, to a charity or an environmental project, or a combination of any or all of these possibilities.

In practice, different CRAGs have developed different ways of functioning. Some do not have a fixed ration and many do not have a financial penalty for over-emitters. In general, one could say that many CRAGs are groups formed to encourage members to reduce their carbon footprints, rather than to engage in carbon *rationing* as such, and some groups have chosen to call themselves Carbon *Reduction* Action Groups.

8.3.3 Current CRAGs

It is questionable whether all 21 UK groups listed as 'active' on the CRAG website really are active; members of two of these CRAGs expressed doubt when interviewed about whether their CRAG was still functioning. One of the active CRAGs, WSP Personal Allowance Carbon Tracking (WSP PACT), is run by the WSP Environment & Energy consultancy business for its employees; the others are all local community groups formed by concerned citizens. At the time of this study,

the groups typically had 8–12 members, although one had only three active members and WSP PACT had 54. Approximately 200–300 people were involved in a CRAG; many more individuals have registered themselves on the website although they are not members of a particular CRAG.

There has also been interest in CRAGs in other countries; the website currently (December 2010) lists active CRAGs in the USA, Canada, and China.

8.4 Method and participants

Table 21: Features of particular interest in the CRAGs included in this study

CRAG	Interviews	Details of interest
Hereford	3	Into third year; rural CRAG; equal-per-capita target; no penalty
Oxford	3	2 years completed; equal-per-capita target; financial penalty but no trading
Hackney and Islington	2	Into second year; equal-per-capita target; operates rudimentary carbon trading
Glasgow	3	Into second year; equal-per-capita target; operates rudimentary carbon trading
Leeds	2	Completed one year; individual targets and penalties; no trading; denotes itself a Carbon *Reduction* Action Group
York	2	Completed one year; equal-per-capita target; no penalty; denotes itself a Carbon *Reduction* Action Group
WSP PACT	3	Part way through first year; workplace-based CRAG; penalty and reward
Fownhope	3	Part way through first year; rural CRAG; percentage reduction rather than equal-per-capita target; no penalty
Peckham	1	New CRAG still starting up; no penalty
Edinburgh[a]	1	A 'failed' CRAG

[a] Since this research was carried out, a new CRAG was started in Edinburgh.

In order to obtain the opinions and experiences of CRAGgers, I carried out semi-structured interviews between June and August 2008 with 23 members of the movement, from 10 different CRAGs. Five were telephone interviews; the rest were conducted face-to-face. I interviewed two couples as couples; the other interviews were one-to-one. The interviews were digitally recorded and transcribed in full, then analysed and coded. The structure of the interviews led to coding using broad, pre-determined themes including 'targets' (see section 8.5.1); 'accounting' (8.5.2);

'financial penalty' and 'PCT' (8.5.3); 'carbon literacy' (8.5.4); and 'behaviour change' (8.5.5), but within these themes codes were allowed to emerge from examining the data, a technique borrowed from grounded theory (Bryman, 2001).

Using contacts gained from the website, I recruited interviewees through emails targeted to particular CRAGs chosen to ensure that a good range of variants was represented: longer-established groups and newer ones, rural and urban CRAGs, those that had a penalty and those that didn't, those that operated a form of trading and those that had chosen not to give the financial penalties to under-emitters, and CRAGs which had fixed targets, percentage reduction targets and individually chosen targets (see Table 21, p. 219). Participants were offered £20 for their time.

8.5 Living with a carbon allowance: experiences, learning and opinions

In what follows, participants are identified by pseudonyms. I have in some cases given an indication of what proportion of interviewees subscribed to a particular view or action, but caution must be exercised in making any generalisations; the interviewees were not necessarily representative of the CRAGs they belonged to, or of the movement as a whole.

Unsurprisingly, the CRAGgers interviewed would generally be classified as 'positive greens' in Defra's (2008a) environmental segmentation model. 'Positive greens', who make up 18% of the UK population (Defra, 2008a), exhibit the most pro-environmental attitudes, beliefs, and behaviour of the general public as a whole. Questions about involvement with other voluntary groups, whether interviewees address concerns other than climate change through their lifestyle choices, and the factors influencing purchasing decisions, revealed that they largely fit the 'egalitarian' type in cultural theory (Dake and Thompson, 1999; Michaelis, 2007). Egalitarians are politically engaged and often make consumption choices based on ethical (including social and environmental) concerns rather than tradition, fashion or price. The interviewees from WSP PACT (the workplace-based group) were less atypical of the general public than most of the CRAGgers interviewed. While having some environmental concerns, they did not mention current spare-time involvement in non-governmental organisations, or specify many consumption/lifestyle choices in

response to ethical concerns apart from climate change. In general, the changes they had made to reduce their carbon footprints were less radical than those made by many other interviewees.

8.5.1 Allowances

Most CRAGs have chosen an equal-per-adult 'carbon allowance' or target, but a few have decided to operate differently. For example, Sevenoaks CRAG targets a differentiated annual percentage reduction from each individual's baseline (the emissions for the year immediately preceding the current one), ranging from 25% reduction per year for those who start with a footprint of 15–20 tonnes, down to 5% reduction for those who start with a footprint of 5 tonnes or lower. In Fownhope all members are targeting a 10% reduction on their baseline footprint. Leeds CRAG allows members to choose their own target, so long as it is lower than the previous year's footprint. The rationale given for variable targets was to encourage low emitters to continue trying to reduce their emissions, while not being too off-putting to high emitters.

In general, equal-per-capita allowances were considered 'fair'. However, one group that started with a fixed target decided after its first year to switch to variable allowances, partly because they have decided that these are fairer:

> …if you are at work you get access to heated lighted premises up to five days a week, whereas if you are retired you don't. So until all aspects are carbon counted then setting personal allowances in the group is a way of taking account of these inequities. (Redland Bristol CRAG, from the website)

Of the 21 'active' CRAGs listed on the website, 11 give children a full allowance, at least for home energy use (it is not always clear what happens when car mileage is being counted), while for six groups there is no information. The other groups have adopted a variety of positions, including giving children under 16 no allowance, giving children under 12 half an adult allowance, and allowing the first two children in a family a full allowance but further children none. A couple of CRAGgers thought that full allowances for their children were/would be problematic as the children do not need an adult's share. On the other hand, two interviewees had noticed an increase in their household energy use as a result of having a baby and

one of these specifically stated that he thought it was important to take this into account.

Most groups that have a per capita allowance started with 4500 kg, a 10% reduction on a rounded approximation of the UK average for direct emissions. Langport CRAG based their first year target of 8400 kg on a 10% reduction in their group average footprint instead, and Glasgow CRAG, which achieved major reductions in their first year, opted for a second year allowance as low as 2000 kg, a 10% reduction on the estimated global average footprint.

8.5.2 Carbon accounting and scheme boundaries

Most interviewees do their own 'carbon accounting' using agreed conversion factors or a specific footprint calculator, though some groups have a 'carbon accountant' to do the calculations.

Whether or how to account for 'green electricity' tariffs and journeys by public transport have been sources of great debate in several CRAGs.

Many CRAGgers argue that signing up for a 'green electricity' tariff does not reduce one's carbon footprint since it does not create more demand for renewables than already exists due to government measures, and renewable energy generation is already accounted for in the electricity conversion factor on a carbon calculator. However, most groups want to give some credit to those who 'do the right thing' so a majority of groups use a lower conversion factor for such tariffs.

Some CRAGs include journeys by public transport in their carbon accounting, others none or only long-distance/regular commuting trips. One CRAG accounts for journeys by public transport at half the usual conversion factors for buses and trains, in order to encourage switching from car travel.

8.5.3 Financial penalties/trading

Of the 21 'active' CRAGs listed on the website, 13 have a financial penalty for exceeding the carbon target, ranging from 2p to 10p per kilogram, with Leeds CRAG allowing members to choose their own penalty. Many of these groups cap the amount that an individual has to pay in any one year (typically at £100). Six CRAGs have chosen not to have a penalty, and for two CRAGs there are no data.

However, at the time of this study, only two CRAGs were definitely operating any form of carbon 'trading', where under-emitters receive payments from over-emitters. Of these, the Glasgow CRAG has since decided, in common with most groups that have a penalty, to give the monies to environmental charities and campaign groups, while the Hackney and Islington CRAG has stopped financial settlements altogether. CRAGgers I interviewed gave various reasons why their group had decided not to have a financial penalty:

> I think they felt it was too sort of Big Brother […] we were there to encourage each other but not to police each other. (Ann)
>
> …we decided not to have a financial penalty because of people's different financial situations. (Anthony)
>
> The idea of a fine for going above a certain amount was thought that it would put potential members off. (Justin)

Similarly, there were various reasons why some CRAGs with a penalty had decided not to give the money to under-emitters, effectively imposing a carbon tax rather than a trading system:

> …those of us who are under-emitters were partly because we'd already done all the cheap measures in our houses, it's not like we could use the money to buy a load of efficient light bulbs or loft insulation because we've got all that stuff already […] we decided we wanted to do the thing that gave us the most carbon offsetting for our money. (Liz)
>
> We felt that there was no point paying money to a well-off middle-class person. (Richard)

There seemed to be a general "embarrassment factor of gaining at somebody else's expense, especially somebody who knew that you were and who you knew" (Simon).

The two CRAGs that operated a (necessarily rudimentary and limited) form of carbon 'trading' were Glasgow, and Hackney and Islington. In each case the financial penalty was fixed and financial settlements took place at specified intervals. In a national PCT system the carbon price would depend on the market (and therefore fluctuate) and trading would take place in real time. In neither CRAG were members prevented from over-emitting because of being unable to buy extra 'credits', as could be the case in a national PCT system. In Glasgow there was no overall emissions cap, and in Hackney and Islington under-emitters saved more CO_2 than the others had emitted over the target.

Many interviewees who were members of a group that had a financial penalty did not think that it had affected their behaviour, partly because the penalties were quite small (though considerably higher than the market price of carbon). Other

interviewees felt that although the possibility of receiving money did not drive behaviour changes, having to pay out might have more effect. One interviewee stated that although he would be willing to make some changes to his lifestyle, he would not be willing to cut out holidays that involve flying. Interviewees who did actually have to pay, or thought it likely they would have to, seemed happy to do so, though one participant suggested that at least one person who had dropped out might have done so because of the prospect of having to pay a large penalty because of a taking a long-haul flight during the year.

When it came to the question of whether they would trade within a national PCT system, several CRAGgers who would clearly have spare allowances to sell, at least in the early years of such a scheme, said they would not do so on principle, or would only sell if they were convinced that the national cap on emissions was low enough:

> …it would depend […] on what the overall budget was. If we had a situation like we have with the phase one ETS, I wouldn't [sell my spare allowance]. Because it's far too high and it's almost meaningless, the only way you can make it meaningful is by destroying the credits. (Steve)

> I don't think I'd want to trade it because one of my worries is the whole issue of global warming and if you trade it then you're merely allowing somebody else to use more. (Ann)

Other interviewees said they would not be willing to sell any spare allowances on an open market, but would consider giving them away or selling them to people for a 'good cause'. A couple of CRAGgers said they would save their spare allowances in order to be able to fly in the future. A minority of interviewees were happy to trade within a national system and said that whether they sold or saved any spare allowances would depend on the carbon price and what they expected their needs to be. One CRAGger offered the very unusual view (among members of the movement) that it would be wrong to 'retire' spare allowances:

> If enormous quantities of these things get bought up and torn up and they can't be used, you're likely to have a collapse of the economy. (Evie)

One interviewee said that if he found himself going over the national allowance he would "find it quite hard to justify why I'd have to pay or make an effort to get more" (Joe) but this was an atypical view.

Despite their reluctance to trade within such a system, just over half the interviewees expressed qualified to enthusiastic support for the introduction of a

national PCT scheme in the UK. One of the main reasons that it found favour was the perception that it would be a redistributive policy. There were concerns, however, among supporters and opponents, about public or political acceptability, the practicalities of implementing a scheme, and about issues of fairness:

> …it would have to be quite complicated in order to make sure that people weren't losing out unfairly, so people that were living in the countryside, somebody with… they probably don't call them iron lungs any more but whatever it is … (Bob)

> Somebody who's not very bright, who lives in poor housing, it's not really their fault if their gas bill turns out to be astronomic. (Richard)

A couple of interviewees had decided that an upstream 'cap and share' system would be preferable to PCT because of the lower costs or because they saw it as a more realistic way forward politically, and one CRAGger preferred the idea of environmental taxation because he saw allowances as too controlling. A small number of interviewees were confused about how a national PCT scheme would work.

8.5.4 Carbon literacy

Increased carbon literacy was perhaps the most obvious outcome of involvement in a CRAG. Most interviewees said that they now have a greater understanding of where their emissions come from and the relative impact of different activities than they did prior to joining the group. There were various mechanisms that increased carbon literacy. Many mentioned monitoring their energy use more closely, and therefore becoming more aware of it:

> I used to perhaps do it once a year. Just add everything up, whereas now […] I'd take my readings more often and I'm checking. So for example this year I know that gas consumption will be more than last year because I've been checking every couple of months… (Liz)

> [W]hen a bottle of gas runs out as it has today, […] we write it down on the calendar so we've got an idea of how long they're lasting. (Lara)

One CRAGger mentioned getting an energy monitor and later said, "I could just go round this room: telly, DVD, video, hi-fi, telephone, gas fire, and pretty much tell you how much carbon would be used by each one in an hour or a day or something" (Steve).

Related to monitoring is the effect of seeing a statement of all one's measured carbon emissions over a period of time:

> I can see that, in Q1 I had a massive 'other journeys', and that was one tonne just associated with the flight to Paris, and […] even as an energy professional, if somebody had said to me a year ago, […] "what would you think a return journey to Paris is equivalent to?", I wouldn't have been able to. (Daniel)

'Ella' had calculated her carbon footprint years before joining the CRAG, which led to her "realising what a massive impact flying had, that was quite an eye opener and that was really important". Monitoring, and seeing the figures, helps to make CO_2 emissions both more 'real' and more salient:

> CO_2… it's quite an abstract concept isn't it, to grasp […] I needed something visual in my mind or some figures on a bit of paper to bring it to consciousness so that was good. (Lara)

The third mechanism was the group discussions and learning from other CRAGgers:

> We've shared loads of information about gadgets like eco-kettles and things that turn your standby off and that sort of thing. (Steve)

> I have learnt more about climate change since being in a CRAG than I'd learnt in the previous 15 years or so. Now we discuss the issue about food, which is a really big issue. (Ian)

This latter comment illustrates that interviewees became more knowledgeable about, or aware of, indirect emissions, and was echoed by others:

> …being a part of [the CRAG] has raised our awareness of all those other things that involve energy. (Dave)

> …I realised that consumption of meat and overseas food was a much bigger deal from a carbon creating point of view than I realised before. (Calum)

Those who didn't think they had learnt more about their emissions said that was because they had already known a lot beforehand.

Some interviewees found that being in a CRAG has enabled them to see more potential for reducing their emissions than they initially thought there was. For example, 'Sally' had done more than she thought she could "simply because one becomes so conscious of it".

8.5.5 Emissions reductions/behavioural changes

Using data from five CRAGs (Oxford, Hereford, Leamington, Glasgow and Sevenoaks) that submitted figures for group/individual emissions both for the year before they started in the CRAG ('baseline emissions') and for their first carbon year, it was calculated that the members of these groups reduced their average per

capita footprint by 32% in their first year, from 4.95 tonnes down to 3.36 tonnes[7]. This average 3.36 tonne footprint is 35% below the UK average of 5.2 tonnes for direct carbon emissions, excluding emissions from public transport (which some of the CRAGs include in their calculations but others don't, or only partially), but including a multiplier of 3 for emissions from air travel (Hillman and Fawcett, 2004). The average baseline footprint was 5% below the UK average. Members of these CRAGs were not, therefore, starting from an emissions position very significantly different from other members of the general public.

Interviewees had generally already started trying to reduce their carbon emissions before they got involved in a CRAG. Many had lower than average emissions at the time that they got involved, and quite a few were already under the target that was set for their group. Nevertheless, most felt that they had continued to change their behaviour and reduce their emissions further since becoming involved in a CRAG. Not all interviewees attributed these changes to their involvement with the CRAG, but some thought that although they would have made changes without the CRAG, being part of the group did make a difference:

> The CRAG has basically accelerated everything really… (Ian)
>
> …without [the CRAG], I don't know, maybe I would still be living like this but I know that I have benefited from support and just having other people who are reinforcing your behaviours... (Ben)

Still others were clear that the changes they have made are a result of involvement in a CRAG.

Two interviewees who had not reduced their emissions since they joined the CRAG said that this was because their emissions were already so low when they started that there was little more they could do.

Table 22 (p. 228) shows behavioural and technological changes made by interviewees (including all those mentioned, not necessarily only those that were the result of involvement in a CRAG).

By far the most common barrier to making changes mentioned by the interviewees was cost, generally of home energy improvements or renewable energy technology. Other barriers that make home energy conservation or technological

[7] This assumes that the baseline figure for the 33 members who calculated it is representative of the baseline emissions for all 58 members who then recorded their emissions during the first carbon year of their CRAG.

improvements difficult included living in an old home, being a tenant, or sharing with less interested others. The need for legislation, infrastructural changes, and grants (e.g. for external insulation) to enable individuals to cut their emissions was mentioned by two interviewees.

When it came to transport, a few interviewees felt they could not give up flying completely, although they had cut down, because of family commitments. The cost and 'hassle factor' of travelling by train rather than flying was also mentioned. The need to drive for work or other reasons was an issue for some, especially in rural areas.

Table 22: Changes made by interviewees, showing the number who mentioned each action

Home energy actions	No.	Transport actions	No.
Turn lights/appliances off/use less	8	Cut down/given up flying	18
Fitting/improving insulation	6	Got rid of car	3
Bought more efficient appliances	5	Lift sharing	2
Installed solar hot water system	3	Chose home location to cut travel	2
Considering home renewables	3	Used biodiesel from used oil	2
Turned down heating/use less	3	Cycle instead of using car/tube	2
Installed secondary glazing	2	Bought more efficient car	1
Installed wood burning stove	2		
Converted Rayburn to wood	1		

Behaviour change was not restricted to those areas where emissions are counted by CRAGs:

> [W]e don't use supermarkets anymore. I use local food shops. […] I don't buy cosmetics that aren't organic […] I don't buy new clothes. I buy and sell on eBay. (Lara)

Sometimes lower-carbon behaviours led to unforeseen problems and very occasionally to tension within families:

> For two years I was running the car on biodiesel which was made from waste vegetable oil […] unfortunately the car had a lot of problems with it just recently; the fuel line has blocked up and it was mainly because I don't top up very often. (Oliver)

> I've made a few mistakes about not realising how far something is away and making the children walk when we should have thought of bikes […] then they've got really upset and sad because they're too tired for walking or whatever and then it's like crisis moment and it starts raining and [my daughter] starts wailing "I want a car". (Evie)

However, several interviewees said that they found living a lower carbon lifestyle easy, and some had discovered positive benefits:

> …we have just looked at alternative ways [of travelling] and I think to be honest to date we've found it a bit of an adventure and quite exciting. (Felicity)
>
> … spending time with the children when we're travelling on buses or walking or cycling and trains is much more pleasurable family time than strapping them in the back [of a car] and turning up the story tape or whatever. (Evie)
>
> Obviously if you can reduce your energy use, you reduce your cost… (Daniel)

Some interviewees considered that reducing emissions from home energy use was easier than reducing their transport footprint, while others had found the opposite.

8.6 Discussion

8.6.1 Allowances

One of the central claims made by proponents of PCT is that equal-per-capita allowances are 'fair' (e.g. Fleming, 2007; Hillman and Fawcett, 2004), but the choice of variable targets by some CRAGs suggests that this may be controversial. This accords with results from recent research on public opinions of PCT (Bird and Lockwood, 2009; Bristow et al., 2010; Jagers et al., 2010; Owen et al., 2008) in which some participants were concerned that the needs of particular groups such as elderly people would not be taken into account under an equal-per-capita allocation system, and argued that certain groups should receive higher allowances. At the end of an extensive study of the literature on distributive justice, Starkey (2008) concludes that the only justification for equal-per-capita allowances is that this is the fairest allocation in practice, if not in theory, but he also argues that it is not clear that this fairest-in-practice argument actually holds.

In the present study, some CRAGs had chosen to allow variable and even self-chosen rations for the purely pragmatic reason of encouraging participation; they would not necessarily argue that their system is fair. But others regard their system of variable targets as more equitable than a fixed allowance (see 8.5.1). It is possible that campaign organisations working for the interests of vulnerable groups, such as senior citizens or disabled people, could oppose the idea of equal-per-capita allowances in a national scheme, and that there would be some sympathy for their position. On the other hand, if the general public were to understand that the allocation of larger allowances to some citizens would automatically mean smaller

allowances for everyone else, unlike in CRAGs, the debate could become very complex. Another possibility, discussed for example by Seyfang et al. (2007) would be some form of compensation (e.g. through the benefits system) for certain vulnerable groups in recognition of their extra needs, or government grants to improve energy-inefficient housing, although such intervention would be costly.

Similarly, the decision by most CRAGs to effectively give children a full carbon ration may indicate that proposals for a compulsory system that would give children only a partial allowance, or no allowance at all, would be unpopular. Again, in CRAGs this choice did not mean that the standard allowance was smaller than it would otherwise have been. If it had, there might have been more debate about the issue of child allowances, and some different decisions. Bristow et al. (2010) found that households with children were, unsurprisingly, particularly keen that children should be given allowances in a theoretical national PCT scheme. It is hard to know how the debate between households with children who would stand to gain from full child allowances, and those who would lose (especially single senior citizen households) might shape in the national arena. Fleming (2007) asserts that an increase in child benefit would compensate families without the need for carbon allowances for children, but provides no empirical evidence that this would be effective or acceptable.

8.6.2 Carbon accounting and scheme boundaries

The detailed, and occasionally heated, debates that CRAGgers have engaged in over what is included in their carbon accounts, and what conversion factors are used, suggest that if the government were to introduce a mandatory PCT scheme, it might need to be prepared to provide information about, and justification for, the conversion factors used in the accounting of such a scheme. A lack of transparency in this respect could possibly lead to opposition, or at least a lack of support, from those who might otherwise be expected to welcome PCT, if they felt that the conversion factors were incorrect in some way. For example, if no multiplier were applied to CO_2 emissions from aircraft to take into account the other pollutants that they emit, and the effects of emissions at high altitude, environmentalists might well regard this as a distorted or even dishonest calculation of the impacts. They could

argue that the resulting rules about the number of permits required to fly effectively subsidise those who continue to engage in polluting behaviour. The use or lack of a multiplier for flights appeared to be an important influence on behaviour within CRAGs. While most interviewees had cut down on flights, or attributed their inability to meet the carbon target for the year to flying, two interviewees, both belonging to the WSP PACT scheme, mentioned that they were planning to continue to fly for holidays. The WSP PACT footprint calculator does not include the multiplier for CO_2 produced by aeroplanes that other CRAGs use, so flights have a significantly lower impact on the overall footprint of WSP PACT members than they do on other CRAGgers.

Arguments could also arise about the inclusion or otherwise of green electricity tariffs and journeys by public transport in a national scheme. Since many of the CRAGs do not make exceptions for green electricity or public transport use because they consider that to do so results in an inaccurate carbon footprint, they might possibly oppose a PCT scheme that has different boundaries. However, it seems plausible that in a national scheme environmentalists might accept that green electricity tariffs and public transport journeys should not require the surrender of carbon allowances, at least to begin with, in order to encourage the general public to accept renewables and switch from car use to public transport. The exclusion of green electricity from an allowances scheme, for example, might promote enough consumer demand to encourage more renewable energy generation, whereas at present the action of a few CRAGgers in switching to a renewable energy tariff makes no difference to the overall energy mix of UK electricity supply. There is a strong case to be made for excluding journeys by public transport in the early years of a national scheme, for reasons of simplicity, keeping costs down, and because public transport contributes only a small proportion of most individuals' emissions (Bottrill, 2006b).

8.6.3 Financial penalties/trading

Given that CRAGs are not actually operating carbon trading, there is little we can infer from them about the implementation of this aspect of a PCT scheme. However, it is interesting to find that so many CRAGgers, whom one might expect to

be supporters of personal carbon trading, would actually be unwilling to sell their spare allowances on an open market. If a large proportion of under-average emitters were unwilling (or failed for other reasons) to trade their spare allowance, this could have serious implications for the effective functioning of the market and therefore of the scheme as a whole. Over-emitters need to be able to buy spare allowances easily, at least in the early years of the scheme, since lifestyle and technological changes will take some time to implement. There is no reason to assume that this unwillingness to sell for moral/environmental reasons will be replicated in the general public, given that it has so far demonstrated less willingness to make such changes in order to cut emissions. Nevertheless, this finding does suggest a need to explore further individuals' willingness to trade their allowances.

The fact that CRAGgers who had to pay a financial penalty found it negligible, even at a carbon price that far exceeds the current market price, suggests that the price of allowances (or transaction costs) in a national scheme would have to be high in order to encourage behavioural change among those unmotivated by environmental concerns, at least those on a reasonably comfortable income. This finding is similar to that of another voluntary carbon trading project in which carbon price did not make an impact on the magnitude of carbon emissions reductions (Prescott, 2008).

8.6.4 Carbon literacy

The increase in carbon literacy that CRAGgers report is a major benefit of the movement. This was largely due to members having to monitor their transport and home energy use and calculate their own carbon footprint, which individuals would not be required to do in a national PCT scheme. Although CRAGgers did not have difficulty budgeting their fossil fuel energy use, the unrepresentative nature of the sample means we should be cautious about generalising from this. Nevertheless, the fact that even 'positive greens' learnt a lot from joining a CRAG suggests that increased carbon literacy could well be an outcome of PCT, to the extent that a PCT scheme encouraged people to pay more attention to their energy use and associated emissions. Even if individuals did not monitor their emissions as closely as

CRAGgers, making a high-carbon purchase or discovering that one's allowance was running low might prompt attention and learning.

A PCT system should also include the provision of regular statements (preferably monthly or at least quarterly) to enable individuals to understand their allowance, and promote carbon budgeting. The statements could show a breakdown of the different elements that allowances are used for (electricity, gas, etc) and the proportion of the quarterly spend and the annual allowance that these represent, in order to encourage awareness of the relative contribution of different activities. CRAGgers' comments about the impacts of seeing their carbon footprint figures suggest that such statements could improve carbon literacy.

In the absence of PCT, other policies such as smart metering, carbon labelling, and/or providing information on household energy bills and fuel and airline ticket receipts about the emissions associated with these purchases might help promote carbon literacy. The UK government currently plans to trial the effects of providing comparative feedback on energy bills (Cabinet Office, 2011), but the aim is to promote energy conservation through social norms, rather than carbon literacy; information on emissions will not be provided. Interviewees' comments suggest that bills that provide comparisons with energy use during the same month of the previous year might also be useful, but carbon emissions really become 'concrete' when understood as a proportion of a total footprint and comparisons can be made between different consumption sectors. It seems unlikely that the practice of carbon budgeting will become much more widespread in the absence of comprehensive statements and allowances. One way forward might be to develop an individual 'recommended annual allowance' based on a per capita share of national emissions targets, and offer information on what proportion of the recommended allowance a particular transaction (flight, energy bill etc) represents.

8.6.5 Emissions reductions/behavioural changes

This study suggests that motivated individuals can achieve carbon footprints that are significantly lower than the UK average. The CRAGgers I interviewed reported few absolute barriers to change, although there was mention of the need for government action and grants to make some changes easier. However, many of the

interviewees were home-owners, which facilitates reduction of emissions from home energy use through installation of insulation, secondary glazing and renewable energy technologies that are unlikely to be considered by those who rent their homes. They were willing to spend time and money to cut their emissions, and to make sacrifices in convenience such as giving up a car (see 8.5.5). By contrast, Ipsos MORI (2008, p. 6) reports that 26% of the general public believe that "Individuals should be expected to do recycling and turning lights off at home but no more", and only 13% agree that "Individuals should be expected to make significant and radical changes to their lifestyle". Capstick and Lewis (2010) found, however, that members of the general public who took part in an experimental simulation of carbon allowances did exhibit budgeting behaviour in response to a declining allowance, and made carbon-conserving decisions.

One of the main ways in which CRAGgers had cut their emissions was by reducing or eliminating air travel from their lifestyles. This suggests that it would be important to include air travel tickets within the remit of any national PCT scheme in order to allow individuals more choice about how to reduce their emissions. Cutting down on flights offers individuals a means to (often significantly) reduce their footprint that is arguably easier than many other behavioural changes (at least in practical terms, once the hard decisions have been made), as well as cheaper if the flight is not replaced by long-distance overland travel. For example, taking a holiday in the UK rather than flying to the Caribbean might involve a once-a-year 'tough decision', whereas commuting to work by public transport rather than using a car necessitates an ongoing commitment. Inclusion of air travel in a PCT scheme offers those who have few options with regard to cutting other emissions (such as those who live in rented accommodation) more opportunity to manage their carbon allowance. The difficulty is that this could lead to double-counting of emissions given that aviation will be included in the EU-ETS from 2012. (This issue applies equally to electricity, already included in the EU-ETS.) However, Prescott (2008) argues that Kerr and Battye's (2008) analysis of the efficiency of PCT suggests that, since policymakers have in practice imposed multiple economic instruments on the same unit of energy precisely because upstream instruments do not seem to change behaviour sufficiently, there is room for both PCT and the EU-ETS.

The fact that behaviour change was not restricted to those areas where emissions are counted by CRAGs may be evidence of 'spillover' effects (Thøgersen and Ölander, 2003), perhaps induced by learning about greenhouse gas emissions from sources other than direct energy use, or because certain behaviours (e.g. reducing home energy consumption) are seen as strongly related to others (e.g. reducing consumption more generally). It may be that some behavioural changes lead naturally to others e.g. using a bicycle rather than a car for grocery shopping might facilitate/necessitate doing shopping more locally, which might in turn lead to a reassessment of whether to use supermarkets. Alternatively, meeting new people through a CRAG might lead to exposure not only to new information but to different social norms. Thøgersen and Crompton (2009) note that evidence for spillover effects is contested and suggest that strong pro-environmental values and norms are necessary for spillover; this might be a factor in the apparent success of some CRAGs in facilitating this effect. Potentially, some spillover effects could be seen as a result of a PCT scheme, (or other policies to induce behavioural changes), where they are not dependent on the specific characteristics of CRAGgers (high motivation, particular values etc) – where they occur because certain behaviours are strongly linked to others, for example. A policy of consistently promoting 'bundles' of behaviours as being closely related might encourage spillover.

8.7 Conclusions

This study offers an understanding of how a particular group of individuals actually experience living with a carbon allowance, as opposed to exploring the idea theoretically. Many of these motivated CRAGgers had achieved carbon footprints significantly lower than the UK average, though not all attributed the technological and behavioural changes they had made to their involvement in the movement. Most did feel they were more carbon literate than when they joined a CRAG, and their comments reveal different mechanisms that facilitated this, with implications for policy.

In some respects the findings offer insights into the potential design and operation of a national PCT scheme; indicating, for example, that there may need to be careful consideration and justification of conversion factors and scheme

boundaries to increase public acceptability of a PCT policy, and corroborating more theoretical research such as that showing that equal-per-capita allowances will not be seen as 'fair' by everyone. However, CRAGs can tell us little about the trading aspect of PCT. The atypical concern and motivation generally exhibited by CRAGgers also means that we cannot draw conclusions from this study as to the likely response to PCT of the general population in terms of emissions reductions. It is clear that further research is needed into the carbon literacy, or 'carbon capability', of the general public, including the ability to understand carbon statements and budget with a carbon allowance, and also to investigate individuals' willingness and ability to trade carbon credits and to make emissions reductions.

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8.8 Additional material relating to Paper 5: The significance of being part of an action group

Increased carbon literacy and behavioural changes leading to GHG emissions reductions can be achieved by individuals without joining a CRAG, and especially given that many interviewees were already making such changes before getting involved in the movement, a key question is why being part of a group is important to CRAGgers. The interviews included discussion about how group processes help members to attain their aims, but the findings were not included in Paper 5 for

reasons of space. A brief presentation of the benefits of belonging to an action group is offered here.

CRAGs differ in how they were set up: a few are composed of people who mostly knew each other at the outset; others involve members who were strangers to begin with. The biggest difference is between WSP PACT and the other CRAGs. The former (workplace-based) group involves members who do not all live in the same area, unlike other CRAGs. Participation within the scheme is limited to submitting personal energy-use data and receiving feedback about one's carbon footprint compared to the target, all done electronically. Members do not necessarily know who else within the company is involved, and do not meet together face-to-face (or take part in internet-based forums) as part of involvement in the scheme, although one WSP interviewee had had informal discussions with colleagues about their emissions as a result of participation in PACT. Generally, there is very little of a 'group' element to this scheme, and it is notable that though interviewees from WSP gained increased awareness and understanding of their emissions from being involved in PACT, they did not mention the other advantages discussed below.

Interviewees who had formed/joined a CRAG where they already knew most of the other members suggested various advantages:

> It means that we know where a lot of people are coming from. (Bob)
>
> …by knowing people, it accelerated the set up in that we knew each other well enough to be quite open and frank and clear about what we wanted to achieve with it. (Felicity)
>
> …we share a lot of common values already and we are able to give each other tips… (Lara)

although one person saw it as a downside because it meant the group involved just the "usual green suspects".

Interviewees also saw benefits in belonging to a CRAG composed of people who had *not* known each other: such a group brought together people from different backgrounds, and with a wider range of perspectives than a group of friends would have, they thought. Interviewees from one group had found they attracted more people than expected by advertising for members locally. Negative aspects of such groups included the perception by some interviewees that their group was not as sociable as it might otherwise have been, and that there was no ongoing conversation about aspects of CRAG management because members did not see each other apart

from at quarterly meetings. One interviewee had found it harder to start a new CRAG without the help of friends that he had had when he set up an earlier group in a different area.

One of the most frequently mentioned advantages to being in a group was variations on the theme of 'moral support', whether through appreciation of participants' efforts by other members, a sense that they are not alone and group achievements are less insignificant than an individual's, the encouragement that comes of being with like-minded people, or the therapeutic value of the group:

> …one of the reasons I've found getting involved with CRAGs so exciting is that it's enabled me to meet lots of other people who I wouldn't have met and to realise it's not just me who's concerned about this, there's a whole body of people out there working on this and that's really quite empowering. (Ella)

> I just love it and last meeting was a really good opportunity to be able to get encouragement if you're finding it difficult. (Evie)

> …one of the key things about the project, I think, for those of us who are in it, is just to share the process and to be able to tell people simple things, like you might feel a bit bad about taking a flight and I think it's almost therapeutic for some people to come and tell people that… (Steve)

> I feel like I'm now in some kind of community of people that have the same concerns and interests... (Ben)

> …being able to be in a group where I'm not regarded as a weirdo and I'm regarded, perhaps, as somebody to be looked up to and can provide information about how to be green, is quite attractive. (Justin)

The other most frequently mentioned benefit of belonging to a CRAG was the potential for sharing information:

> I certainly think that I have found out information at the CRAG that I wouldn't necessarily have found out otherwise, just from people trying things out in their own houses and telling us. Insulation materials, where to find things, gadgets that help; really practical basic things like that. I don't know if I would have actually managed to find those things myself. (Steve)

> …there's just a need for local groups where people can just go and talk about this stuff and find out about it […] that's partly why we get such a high throughput of people who come, because there's just nowhere else for them to go at all […] they've just been people who wanted to know a bit. (Ella)

As mentioned earlier (section 8.5.4, p. 225), sharing information was one of the mechanisms through which CRAGgers developed greater carbon literacy, an important outcome of involvement.

About a quarter of the interviewees mentioned that they find the sense of accountability to the group helpful in encouraging them to take action, that they appreciate the opportunity to encourage and influence others, and that they enjoy the social aspects of being part of a group. Further advantages of being in a group rather

than acting alone mentioned a few times included a helpful sense of competition or comparison with others, the discipline or sense of focus brought by commitment to a group, and the greater influence that a group has; for example:

> …by having a structure and a name and quite an innovative idea, it's also given us as environmental campaigners or concerned citizens some credibility with the local council, with the local environmental network […] we do get invited and included and referred to. (Felicity)

Some groups provided opportunities for involvement in activities beyond personal carbon counting/ reductions:

> …there's people there who are trying to push the ideas in various ways, going on marches and having little work groups and doing things like that so there is this kind of sense of the wider activity out there. (Liz)

> … right from the outset I felt encouraged by people's evident interest in taking the whole thing further and actually wanting to do positive things on a community basis, influencing things at a community level. (Simon)

and there are also benefits of being connected to a national network:

> …there is an online [website], carbonrationing.org, which I don't look at that often but it is actually quite a nice sense of community and occasionally I do get email messages through that from other CRAG people… (Liz)

> …the website and all the stuff that people put on there that's good and interesting: news items and facts and figures, so there's a resource that we wouldn't have on our own… (Ben)

When invited to comment on any limitations of CRAGs, or any ways in which their hopes or expectations of involvement in the group had not been met, interviewees most frequently responded that they were disappointed that there were not more people involved, either in their own CRAG, or in the movement as a whole. It seemed to them that there were not enough CRAGs, that new CRAGs had trouble getting going, and that the concept had limited appeal. Some felt that their group struggled to draw new people in because existing members did not have the time or energy to devote to outreach.

Problems with group processes were also mentioned, including poor organisation, meetings at which little is achieved, and not enough of a social element to some groups.

One interviewee had tried to start a CRAG in Edinburgh, which met only once and "petered out within a few months of it being set up". There are perhaps useful lessons to learn from this example of an unsuccessful CRAG. The founder thought that the main reason for this failure was that there were so few people who got together to form the CRAG. He also felt that there was a "lack of social affinity"

between the people who had come to the first meeting, since they were people of different ages and walks of life. Perhaps crucially:

> I wasn't able to find anyone that was prepared to help with the task of making the CRAG an *ongoing lively project* and so we didn't meet again. We exchanged a few emails. […] I felt we would hold another meeting if maybe somebody had contacted me and said, "Let's get back together and see how we are all getting on", but nobody wanted to. Nobody emailed me and I didn't want to put too much of my energy into it… [emphasis added]

This point is, I believe, significant. I attended the first meeting of this Edinburgh CRAG and wondered whether it would survive. The meeting was brief, business-like, and practical, with no social element and little discussion. A carbon ration for the year was agreed, and some rules about what would be counted. The plan was then for members to go away, keep records, and meet again after a year with results in hand. Without regular meetings planned between the yearly accounting sessions, this CRAG lacked the moral support, information sharing, and other functions that most CRAGgers reported as being such useful aspects of belonging to their group. It is hard to see how the Edinburgh CRAG set-up could have engendered a sense of commitment to the group, or done much to help members make emissions reductions. (This is not to criticise the founder, who, as he stated, did not have much support.)

Although some of the benefits interviewees mentioned of belonging to a group do not translate obviously or directly into emissions reductions, these findings complement those of other researchers who stress the advantages of 'carbon reduction' community groups, including providing lower carbon exemplars; creating platforms for inter-community conversation and sharing of experience; and overcoming barriers posed by social dilemmas (e.g. "Why should I take action when others don't?"), social conventions, and perceived lack of agency (Heiskanen et al., 2010; Mulgetta et al., 2010).

Part Three: Conclusions

Chapter 9: Promoting lower-carbon lifestyles: synthesis and conclusions

9.1 Summary of the papers and key findings

9.1.1 Paper 1: Lights, camera… action? Altered attitudes and behaviour in response to the climate change film The Age of Stupid

Paper 1 (Chapter 4) addresses the first aim of this thesis: to assess the impact of a climate change film on the attitudes and behaviour of the audience it gained when it opened in cinemas. The impacts of the film *The Age of Stupid* were considered worth examining because it is essentially a fear appeal, and the literature is inconclusive about whether such a type of communication would be motivating or would instead contribute to feelings of disempowerment and despair. The project deliberately focused on viewers who paid to see the film at an Edinburgh cinema, rather than recruiting participants to a special showing, since there is arguably limited value in understanding the impacts of a film on people who would not choose to see it otherwise (nor watch it as part of the compulsory school curriculum).

A three-stage quantitative panel study showed that the film increased viewers' concern, motivation to act, and belief in their ability to "do something about climate change" immediately after seeing the film, but that these effects had worn off by the time of the follow-up 10–14 weeks later. The film appeared to have some effect on (self-reported) behaviour, and there was a positive correlation between the level of concern expressed after seeing the film (both immediately and at the time of the follow-up) and the number of actions taken in response to it. However, respondents were most likely to be engaged in easier behaviours for reasons other than the influence of the film, and to report that they had not taken up more difficult/costly behaviours after seeing it.

Regarding the question of whether 'fear appeal' type communications motivate action or inhibit it by reducing perceived agency, this film did not appear to have a negative impact, and in fact participants who were most likely to accept the possibility of worldwide devastation due to climate change by 2055, as depicted in the film, had higher scores for post-viewing action. However, the audience was

atypical of the general public in terms of their pre-film levels of concern, knowledge about how to reduce their GHG emissions, and engagement with groups campaigning about climate change, and thus this finding cannot be generalised.

From the point of view of promoting lower-carbon lifestyles among the general public, perhaps the most important finding of this paper is that the sampled audience of the film consisted so overwhelmingly of those already engaged with the issue of climate change. If this is generally true of climate change films, it suggests that they may have little influence beyond a minority of the population, who arguably are those who least need persuading of the importance of the issue and the need to take action.

9.1.2 Paper 2: Investigating the long-term impacts of climate change communications on individuals' attitudes and behaviour

Given the relative lack of longitudinal studies of the impacts of communications designed to promote lower-carbon behaviours, the second aim of this thesis was to assess the longevity of the impacts of *The Age of Stupid*, especially any behavioural changes made. Paper 2 (Chapter 5) addresses this aim and goes further by also offering a discussion of the challenges of conducting long-term investigations of behavioural change inspired by climate change communications.

The paper compares the results of a second follow-up questionnaire, completed by viewers of *The Age of Stupid* fifteen months after they saw the film, with the responses they gave at the first three time-points of the study reported in Paper 1. The results show that behavioural intentions do not necessarily translate into action, but suggest that actual behavioural changes attributed to the influence of the film might have persisted, and that there were possibly some 'late-starters' belatedly taking film-inspired action that was not picked up on at the time of the first follow-up (demonstrating the need for longer-term research). However, the key finding was that participants' attributions of their actions to the influence of the film were not reliable.

Thus the main conclusion that can be drawn from this paper is a methodological one: there is a need to find better methods for evaluating the long-term impacts of climate change communications (and other interventions), and these will likely require significant resources to recruit members of the general public for

longitudinal studies that do not have to rely (solely) on self-reports of behaviour and attributions of action. It is possible that some problems cannot be satisfactorily addressed: for example, the obvious alternative to asking research participants to provide reasons for their actions is to infer such reasons from the timing of behavioural changes, but it is not clear that this would be any more accurate.

9.1.3 Paper 3: Using the transtheoretical model of behavioural change to understand the processes through which climate change films might encourage mitigation action

Building on my empirical investigation of the impacts of *one* climate change film, Paper 3 (Chapter 6) broadens the work to consider more generally the potential for climate change films (and by extension, other climate change communications) to promote climate change mitigation action. The paper is intended to introduce a model of health-related behavioural change to researchers and practitioners concerned with pro-environmental behavioural change, and provide an example of how it can be used, as detailed in the third aim of the thesis: to analyse climate change films using a model of behavioural change from health psychology to (a) identify their strengths and limitations as means to promote climate change mitigation action, and (b) demonstrate the potential utility of the model in the field of pro-environmental behaviour change.

The paper demonstrates how the model can be applied to assess whether the processes of change used or depicted in climate change films match the stages of change that target audiences are expected/likely to have reached. My own and others' analyses of the impacts of the exemplar films are used to discuss as far as possible whether there is any evidence for effects that the model suggests might occur. Research designed specifically to determine whether films demonstrating particular processes of change stimulate stage progression is needed to confirm whether the model would be a useful tool to employ when designing climate change communications; evidence from the health-promotion field suggests that this would be worth investigating.

Regarding the potential role of films in promoting lower-carbon lifestyles, the primary conclusion of this paper is that apart from boosting the morale and reinforcing the activities of those already engaged in climate change mitigation

action, films are most likely to be useful to foster contemplation of behavioural changes, or to encourage contemplators to move on to the preparation stage. Therefore it is necessary to find ways for films to reach audiences who are at early stages of change with regard to lower-carbon behaviours.

9.1.4 Paper 4: It's not (just) "the environment, stupid!" Values, motivations, and routes to engagement of people adopting lower-carbon lifestyles

Paper 4 (Chapter 7) presents research designed to fulfil the fourth aim of this thesis: to examine the motivations for, and pathways to engagement in, lower-carbon behaviours and lifestyles. This project mainly involved in-depth, partly narrative-style interviews with individuals who have adopted lower-carbon lifestyles. Hypotheses about their values that were developed during the analysis of the qualitative data were then tested using a quantitative survey instrument.

Interviewees' discourses emphasised social justice, community, frugality, and personal integrity. The data show that most of them were not motivated primarily by concerns about 'the environment' *per se*; their actions often stemmed from concerns about the impacts of climate change on people in developing countries, and the perception that these impacts are caused mainly by the lifestyles of people in rich countries who will suffer fewer consequences evoked a keen sense of injustice. In addition to early positive experiences in nature and connections with environmental campaigns, interviewees' narratives revealed pathways into climate change mitigation action through human rights groups and concerns. On the values questionnaire, most interviewees scored altruistic values higher than biospheric values, although the latter were also important to them. Although many participants gave a list of actions to take and items to have or avoid having when asked to say what 'a low-carbon lifestyle' suggests to them, some offered much broader and less tangible visions, and some expressed a lack of interest in discussing 'climate change'.

As explained in Chapter 7, these findings imply that it is not necessary to foster biospheric values in order to stimulate lower-carbon lifestyles; policymakers and campaigners could look to tapping into other concerns and values, especially social justice. If behaviour change is the aim of government, there is also a need to consider

whether and how to introduce policies (e.g. restrictions on advertising) that could contribute to making opposing 'self-enhancement' values less salient, and promote social norms of frugality and sharing of resources such as vehicles. The paper also suggests that there is value in promoting the development of holistic visions of what a lower-carbon future could entail, going beyond simple 'ten steps to save the planet' type messages.

9.1.5 Paper 5: Living with a carbon allowance: The experiences of Carbon Rationing Action Groups and implications for policy

The final aim of this thesis, to understand the experiences and opinions of individuals attempting to live within a carbon allowance, and assess the implications for potential policies (especially PCT), is addressed in Paper 5 (Chapter 8). This reports the findings of a qualitative study involving interviews with members of CRAGs.

Improved carbon literacy was an important outcome of involvement in a CRAG; three mechanisms through which this was achieved were identified: monitoring energy use and converting it to emissions statistics; seeing complete carbon footprint statements for a period of time; and group discussions and shared learning. Many CRAGgers interviewed had made significant behavioural changes and generally did not find these too difficult, although some experienced barriers to further change, especially the cost of home energy improvements and renewable energy technologies. Being part of a group was helpful and important to interviewees for many reasons, especially for moral support, to increase their sense that they could 'make a difference', and for information sharing. The work provided some insights into potential considerations for a national system of personal carbon allowances (generally referred to as PCT), but there are limitations regarding what it is possible to learn from CRAGs about PCT, especially because very few CRAGs actually operate any kind of trading system, and those involved are highly motivated.

A key conclusion from this paper is that when people are motivated, they *can* significantly reduce their carbon footprints. One of the main ways interviewees achieved this was to cut down or stop flying. Acting with others in a group has important benefits. Carbon footprint statements help individuals to understand the

relative impacts of different aspects of their lifestyle; it would be worth exploring ways to make the emissions associated with different activities visible to the public. However, it is not clear how much support there would be for a national PCT scheme.

9.2 Overall conclusions

The research reported in this thesis largely involved people already committed to climate change mitigation action, though to differing degrees, and these people are atypical of the general public in terms of their level of concern about climate change (especially relative to other issues), and their sense of responsibility for the problem. There is a need to engage more of the population if the demanding targets for UK GHG emissions are to be met (see Chapter 1).

Data from the interviews reported in Paper 4 (Chapter 7) suggest some ways forward for policymakers and climate change campaigners in that respect, seeking to make common cause with organisations that are concerned about social justice and human rights, and that promote altruistic values, but have historically not been very involved in what are seen as 'environmental' issues. There are some interesting initiatives emerging from religious groups, such as the Church of England's 'Shrinking the Footprint' campaign[8] and calls for a Lenten 'carbon fast' (Aldred, 2008; Vaughan, 2009), although religious discourses about climate change still reveal mixed opinions (Wardekker et al., 2009). It is also encouraging that large NGOs concerned with development such as Christian Aid and Oxfam have recognised the importance of promoting climate change mitigation action. It might also be possible to attract more people by emphasising other benefits associated with lower-carbon lifestyles, such as quieter roads and stronger communities, though the literature reviewed in Chapter 2 makes clear that there are dangers in stressing financial benefits (section 2.6.10). However, it is unclear what proportion of the population might be moved by such appeals since values inimical to altruism as well as to environmental concerns are a strong feature of our culture, and even committed people face barriers to action because of costs, social norms, family pressures,

[8] See http://www.churchcare.co.uk/shrinking-the-footprint.

inconvenience and other obstacles, as shown in Paper 1 (Chapter 4) and Paper 5 (Chapter 8).

The finding that the film *The Age of Stupid* attracted an audience that was generally already taking some action to mitigate climate change, and the conclusion of Paper 3 (Chapter 6) that films may be most useful for viewers at earlier stages of change, suggests a need to recruit different audiences to see such films. Incorporating films into, and/or designing them for use as part of, the school curriculum is perhaps the main possibility, although the range of behaviours over which children have some control is considerably smaller than that for adults. The role of films in reinforcing lower-carbon behaviour among 'the converted' should also not be overlooked. However, the limitations of films in promoting actual behavioural changes mean that it seems likely that the primary role for films and other climate change communications in promoting lower-carbon lifestyles will be to encourage and reinforce enough demonstrable public concern and community-level initiatives such as Carbon Conversations and CRAGs to persuade politicians to take more radical political action.

The scale of action required, the difficulties individuals face when considering whether and how to adopt lower-carbon behaviours, both practically and because of the social dilemmas of restricted agency and free-riders, and the limited impact of initiatives such as CRAGs and *The Age of Stupid* beyond a relatively small circle of well-educated people who tend to exhibit particular personality traits (such as a preference for frugality), lead me to conclude that significant UK emissions reductions will necessitate far-reaching legislation that will impact on everyday practices and behaviour. Hence the necessity for research that seeks to explore the implications of policies such as PCT (Chapter 8), but also the importance of discovering how NGOs can better promote lower-carbon lifestyles, since arguably voluntary action is needed to persuade governments to take more serious steps to mitigate climate change (Goodall, 2007).

The review of literature on promoting change (Chapter 2; see especially section 2.6.13, p. 81) suggests that such government policies should not focus solely on individuals, but should promote normative change across all sectors of society. It is necessary to address structural as well as psychological factors influencing

behaviour, seeking to remove situational constraints on change. Significant behavioural changes should be targeted, and a 'whole lifestyle' approach taken to reduce rebound effects and increase the possibility of spillover. Broad ethical and political issues need to be considered, rather than just market strategies, and policies must be perceived to be fair to be acceptable.

9.3 Contributions of this thesis to the field of study

9.3.1 Methodological contributions

This thesis offers several important methodological contributions to the study of promoting lower-carbon lifestyles, and pro-environmental behavioural change more generally.

First, it recognises that change is a process over time, and therefore studies not only behaviour and how it relates to values, attitudes, social context and so on, but also how behaviour changes over time, examining both changes in self-reported responses to a climate change film over a significant period of time as well as immediately, and narratives of change given by interviewees who have made noteworthy reductions in their GHG emissions. This is not unique, but both longitudinal studies of change and qualitative studies of pro-environmental behaviour (which reveal stories of change) are under-represented in the literature (Anable et al., 2006; Chawla, 1998b; Steg and Vlek, 2009).

Second, the thesis considers lifestyles as a whole, including a wide range of practices and behaviours (see Table 1, p. 25, for a typology and examples) rather than focussing on a particular practice/behaviour or a related set (such as 'transport choices'). Although a narrower focus is appropriate in some cases, the broad approach taken here allows for consideration of cases where an individual has made radical changes in one area but not in others, and for discovery of potential 'spillover' or 'rebound' effects, whereby action in one sphere influences action in another positively (as reported by some interviewees in Chapters 7 and 8) or negatively (e.g. through justifying inaction or action that will lead to increased emissions, not found in this research).

Third, the thesis includes a discussion (and partial illustration) of the difficulties of conducting longitudinal research into the effects on behaviour of climate change communications (and other interventions). Thus it offers a reflection on the methods used and the methodological challenges that need to be overcome in this field of study, which have to some extent been ignored in the focus on quantitative surveys of predictors of behaviour and (often lab-based) studies of short-term impacts of communications and interventions.

Finally, the thesis highlights a behavioural change model from the discipline of health psychology and explains how it could be used in the pro-environmental behaviour change field. Although a few studies in this field reference or use the model (see section 6.2.2), it has so far received very little attention and has not, as far as I am aware, been used to analyse sustainability-related communications. Thus this paper (Chapter 6) brings to wider attention a methodological tool that could have significant potential in the study and design of communications (and indeed other interventions) intended to promote lower-carbon lifestyles and pro-environmental behavioural change.

9.3.2 Contributions to knowledge

In terms of quantitative results and evidence from the qualitative data, this thesis extends knowledge in the field in various ways.

Paper 1 (Chapter 4) and Paper 2 (Chapter 5) contribute to research on the impacts of visually-based and emotionally-engaging climate change communications on viewers' attitudes and behaviour. Though not unique, the design of the study to explore how *The Age of Stupid* affected respondents' sense of agency, whether increased motivation to act led to behavioural changes, and whether behavioural intentions were actually carried out, does extend understanding in a field where there is more research into concern about climate change than beliefs about action, and examination of factors related to intention/willingness to act rather than reported behaviour. Paper 3 (Chapter 6), while more theoretical and using secondary data to examine insofar as possible whether model predictions are borne out by the available evidence, also contributes to understanding how films can be used to promote behavioural change, *via* progression through stages of change.

Paper 4 (Chapter 7) offers a deeper understanding of the values and motives of people who have adopted lower-carbon lifestyles than can be gained from the more usual quantitative surveys of factors related to pro-environmental behaviour. The paper also includes some discussion of the routes into engagement with lower-carbon behaviours, an area where there have been few studies apart from that by Hards (2012) and work in the field of environmental education, where studies of significant life experiences leading to pro-environmental action have tended to focus on environmental professionals (e.g. Chawla, 1999; Palmer et al., 1999).

Paper 5 (Chapter 8) presents a unique study of how individuals experience living with a carbon allowance, complementing laboratory-based simulation studies such as that by Capstick and Lewis (2010). While the experiences of motivated individuals such as the CRAG members interviewed cannot be generalised to the population as a whole, they nevertheless give some indication of what is theoretically possible for individuals to achieve in terms of carbon footprint reductions. Chapter 8 also extends knowledge about how carbon literacy develops, and how being part of a group can help individuals achieve their emissions reductions goals. Both Paper 5 (Chapter 8) and Paper 1 (Chapter 4) also briefly discuss barriers to action experienced by the research participants, and these *are* likely to be generalisable, since it is doubtful that the general public as a whole will be able to overcome difficulties that prevent action by those who are most motivated to mitigate climate change.

There are, of course, limitations and omissions in this thesis, and these are discussed in the next chapter.

Chapter 10: Limitations and recommendations for further research

10.1 Limitations of the thesis

Many of the limitations of this work have already been discussed in the papers comprising the thesis. Relying on self-reported measures of behaviour, as I have done, is problematic because there is a tendency to overestimate one's own pro-environmental behaviour (Chao and Lam, 2011; Corral-Verdugo, 1997). Paper 2 (Chapter 5) considers some ways that this issue can be overcome. Overestimation was probably less of a problem with the interview projects as it is perhaps harder for participants to give false information when they are discussing their practices in some detail. When interviews were carried out in the interviewees' homes, I was occasionally able to see evidence of some of their actions, such as solar panel installations and composting bins. Carbon footprint data were also collected where possible from interviewees, although this is not reported in Papers 4 or 5 because data were not available for all interviewees, and were not given in a standard, comparable form for those that did have figures. Problems with self-attributions of the reasons for action, and the difficulty of pinpointing any one influence on behaviour are also discussed in Paper 2.

A minor drawback with the study of the impacts of *The Age of Stupid* was the design of the second questionnaire. The question "What message are you taking away from the film?" would have been better placed first, to avoid the risk of respondents' answers being influenced by questions about concern and belief in the likelihood of worldwide devastation due to climate change (see Appendix 2 for a copy of this questionnaire). This does not have a particularly significant impact on the study as a whole; it may simply mean that the answers to that particular question were more negative than they might otherwise have been.

The main limitation of Paper 3 (Chapter 6) is that is does not report empirical work testing what stage of change individuals have reached in relation to lower-carbon behaviours, and whether film(s) lead to or correlate with stage progression. However, this is intended to be a paper that introduces the model to this field of

study and illustrates how it could be used, rather than a rigorous empirical investigation in its own right.

The qualitative study presented in Paper 4 (Chapter 7) reveals the motives and values of individuals who *are* taking action to mitigate climate change, but it cannot tell us why others do not. It would be particularly interesting to know whether – and if so, why – people with the same values are not taking action. The other qualitative study, reported in Paper 5 (Chapter 8), suffers from the fact that it was not possible to separate out exactly what participants had done as a result of being in a CRAG and what they would have done anyway. This again relates to the problem of attributing behavioural change to particular causes, and the best it was possible to do was to ask interviewees to give their opinion of how much difference belonging to a CRAG had made to their lifestyle.

The greatest limitation/omission in this thesis, however, is that the reported research does not take much account of the perspective of social practice theory outlined in Chapter 2 (section 2.2.10, p. 52). Although informed by insights from a range of disciplines, the papers tend to reflect an environmental- and social-psychological paradigm, considering the individual as the site of enquiry and regarding issues such as social norms and context as 'factors affecting behaviour' or 'barriers to change' rather than as inherently part of practices, reproducing and being reproduced by them.

A psychological approach such as that taken in *The Age of Stupid* study is appropriate when seeking to understand the impacts of a specific climate change communication on individuals' attitudes, and then to determine whether any attitudinal changes translate into behavioural changes. The same is true of the research reported in Paper 5 (Chapter 8), since the aim was to examine the opinions and experiences of particular people who have negotiated and are attempting to live within a carbon allowance, rather than to examine more generally what has influenced or created behaviour/practices.

The interview project described in Chapter 7, however, did seek to take account of sociological critiques of psychological approaches to questions regarding lower-carbon lifestyles. Although individuals, rather than practices, were still the site of enquiry, the narrative style of the first part of the interviews was designed to allow

interviewees to tell stories about practices, and to frame those however they chose. I was attempting to see whether their narratives focused more on the influence of structures (whether infrastructural or social), habits, and moments of transition in the life-course (such as moving house or starting a new job), or on more psychological concepts such as personal values. Having listened to these narratives, I discussed the relative influence of structures and values with participants towards the end of each interview. As explained in Chapter 3, I also asked each interviewee to draw a 'car use life graph' before the interview, so as to be able to examine the meanings and materials (e.g. type of car) associated with this particular practice as it had evolved through each person's life (see Appendix 7 for the instructions sent to participants about how to draw their car use life graph).

Discussion of these aspects of the project is not included in this thesis for the simple reason of limited time – it became necessary to pause in writing papers and produce a thesis. Future papers are intended to cover this material, which will therefore encompass more of a social practices approach.

10.2 Recommendations for future work

The conclusions of the papers and the limitations discussed above suggest several recommendations for future projects that might address the gaps in this thesis and build on what has been learned:

(a) Longitudinal studies of the impacts of climate change communications and behaviour change interventions that do not rely (solely) on self-reported behaviour (e.g. by using a measure of participants' carbon footprints alongside interviews or a survey to understand why and how behaviour changed) and that attempt to better isolate those impacts (e.g. by including a control group that is not subject to the intervention but *does* do any measuring tasks).

(b) Development of the methodology for determining stages of change related to lower-carbon behaviours, and use of this in surveys of correlations between stages and processes of change, and in experimental studies to determine whether particular processes of change encourage stage progression.

(c) Investigation of the impacts of climate change films on the attitudes and behaviour of individuals who are at early stages of change with respect to lower-carbon behaviours; perhaps especially schoolchildren (e.g. those exposed to *An Inconvenient Truth* as part of the curriculum), as others are not likely to see such films unless they choose to watch them (which this thesis suggests means they are likely to be engaged with the issues already). Such research would need to recognise the limited agency of schoolchildren, however, and could perhaps also consider whether they influence their parents/carers in any significant ways as a result of seeing such films.

(d) A qualitative study of people who are not taking (much) climate change mitigation action, to determine their values and their attitudes towards climate change and mitigation action. Are there individuals with similar values to those of the interviewees featured in Chapter 7 who are not making behavioural changes, and if not, why not?

(e) Larger-scale quantitative surveys to test the conclusions of Paper 4 (Chapter 7), asking about respondents' lower-carbon behaviours and their level of agreement with statements assessing attitudes not only towards the environment but also social justice, community, frugality, and personal integrity, in order to determine whether attitudes towards these issues are generally predictors of lower-carbon behaviour.

My primary recommendation, however, is that there should be more of a focus on how and why practices develop and change, and on interventions and policies that might change the contexts of behaviour/practices, and will not require individuals to make conscious choices to 'save the planet' or 'combat climate change'. At present it seems likely that only a minority of the UK population feel such concerns strongly enough to make significant changes to their lifestyles. Thus we should investigate how to make lower-carbon behaviours easier and more the norm, carried out as part of everyday routines because they have become standard practice (as is now the case with kerbside recycling in many parts of Britain) or because the relative costs and benefits have changed (such as with the introduction of the London congestion charge, which has led to a notable reductions in vehicle traffic in the charging zone (TfL, 2008), indicating significant behavioural changes).

For example, one promising area of research is to explore how to make it easier to develop new low-carbon habits when normal patterns of behaviour are disrupted at times of transition during the life-course. Work is being carried out by the Sustainable Lifestyles Research Group[9] into lifestyle changes at three key transition times: moving house, having a first child, and retiring. Another key transition time, which might be a fertile area for future research, is when young undergraduates move from their parental home to university. During an undergraduate career, students often find themselves having responsibility for the first time for activities such as cooking and paying energy bills. Choices made at this time, and the habits thus created, may last many years beyond university, and therefore have significant impacts on the sustainability or otherwise of citizens' lifestyles. There is potential for a research programme that would explore how practices develop and change during undergraduate careers and immediately afterwards: what practices are taken up, when, and why; how long they last; and the attendant environmental/sustainability impacts. Such research would have applications beyond the university setting, providing more general insights into the factors that maintain current lifestyle choices, and what can change them.

Given the serious threat of climate change, the stringent UK GHG emissions reductions targets, and the significant contribution that everyday individual/ household practices and behaviours make to emissions (as outlined in Chapter 1), there is clearly a need for much more research into how to promote lower-carbon lifestyles.

[9] The Sustainable Lifestyles Research Group is headed by researchers at the University of Surrey and includes partners at Bath, Sussex, Edinburgh and Brunel Universities, and The Institute for Fiscal Studies. See http://www.sustainablelifestyles.ac.uk/.

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Appendices

Appendix 1: First *Age of Stupid* questionnaire (Q1)

Public opinion survey about *The Age of Stupid*[10]

PART 1 Please fill this in and hand it to a researcher BEFORE you see the film

1a. Why did you come to see *The Age of Stupid?* *Please tick all reasons that apply*

☐ A. I saw the trailer in the cinema and the film looked good
☐ B. I saw the website and the film looked good
☐ C. It was recommended by someone I know
☐ D. I was invited to come with someone else
☐ E. I liked other films featuring Pete Postlethwaite
☐ F. I'm interested in/concerned about climate change/global warming
☐ G. Other

1b. If you have ticked more than one reason above, please give the letter of the ONE that is your MAIN reason for coming to see the film: _____

2. How concerned are you about the following global issues?
Please tick ONE BOX on EACH LINE

	Not at all concerned	***Not very concerned***	***A little concerned***	***Somewhat concerned***	***Very concerned***
AIDS					
Species extinctions					
Climate change/ global warming					
'Credit crunch'/recession					
Poverty					
Terrorism					

Please turn over

[10] The font on the original questionnaire was larger; it has been reduced to fit the margins of this thesis.

3. To what extent do you agree/disagree with the following statements?
Please tick ONE box on EACH LINE

	Strongly disagree			**Neutral ↓**			**Strongly agree**
	1	2	3	4	5	6	7
I feel motivated to try to do something about climate change/global warming							
I can do something to prevent climate change/global warming getting worse							
I know what I can do to reduce my carbon emissions							
Cutting my carbon emissions won't make a difference to the problem of climate change/global warming							
It's worth lobbying politicians about climate change/global warming							
I do as much as I can about climate change/global warming							
I fear humanity will not do enough to prevent catastrophic climate change/global warming							

Your gender *please circle*: **Male / Female**

Your age *please circle*: **16-24 25-34 35-44 45-54 55-64 65+**

Your occupation: _____

Your highest educational qualification: _____

Please tick as appropriate:
☐ I have *donated money* in the last year to a local or national group that campaigns partly/wholly about climate change/global warming (e.g. Friends of the Earth, RSPB, Oxfam, Transition Towns, WWF)

☐ I am *actively involved* (e.g. writing letters/attending events/taking personal action) in a local or national group that campaigns partly/wholly about climate change/global warming

The MOST IMPORTANT part of this research is to understand participants' opinions after a few weeks. ***Would you be willing for me to send you a short follow-up questionnaire? If so, please fill in your contact details on the next page.***

THANK YOU! Please hand this sheet to one of the researchers before you see the film. Keep Part 2 with you & fill it in after the film to get your £5 Filmhouse voucher.

OPTIONAL
I would be very grateful if you would be willing to give me your contact details so I can send you a short follow-up survey in a few weeks (I will be offering a further 'thank you' to those who take part in the follow-up). ***This sheet will be separated from your answers to the survey to preserve your anonymity.***

Your name: _____

Your email:																									

Your postal address if you would prefer to be contacted that way:

_____

_____

THANK YOU! ***Rachel Howell***

Appendix 2: Second *Age of Stupid* questionnaire (Q2)

Public opinion survey about *The Age of Stupid*[11]

PART 2 Please fill this in AFTER you have seen the film and return it to one of the research team in the foyer in order to receive your FREE £5 Filmhouse voucher

1. How likely do you think it is that the world could be devastated by climate change/global warming and related problems, in the way it is in the film, by 2055? *Please tick ONE box*

☐ Virtually certain (over 99% chance)
☐ Very likely (90-99% chance)
☐ Likely (66-90% chance)
☐ Medium likelihood (33-66% chance)
☐ Unlikely (10-33% chance)
☐ Very unlikely (1-10% chance)
☐ Extremely unlikely (less than 1% chance)
☐ Impossible

2. To what extent do you agree/disagree with the following statements?
Please tick ONE box on EACH LINE

	Strongly disagree			**Neutral** ↓			**Strongly agree**
	1	2	3	4	5	6	7
I feel motivated to try to do something about climate change/global warming							
I can do something to prevent climate change/global warming getting worse							
I know what I can do to reduce my carbon emissions							
Cutting my carbon emissions won't make a difference to the problem of climate change/global warming							
It's worth lobbying politicians about climate change/global warming							
I do as much as I can about climate change/global warming							
I fear humanity will not do enough to prevent catastrophic climate change/global warming							

3. In your opinion whose responsibility is it to try to reduce the emissions that cause climate change/global warming? _____

_____

Please turn over

[11]The font on the original questionnaire was larger; it has been reduced to fit the margins of this thesis.

4. How concerned are you about the following global issues?
Please tick ONE BOX on EACH LINE

	Not at all concerned	***Not very concerned***	***A little concerned***	***Somewhat concerned***	***Very concerned***
AIDS					
Species extinctions					
Climate change/ global warming					
'Credit crunch'/recession					
Poverty					
Terrorism					

5. How has the film affected you? *Thinking ONLY of the film, not about the speaker/info stall if there was one, please tick ONE box on EACH LINE*

Because of the film…	**No**	**Yes, a bit**	**Yes, a lot**
I feel more motivated to try to reduce my carbon emissions than I did before			
I feel more motivated to lobby politicians about climate change/global warming			
I have more idea about what I can do to reduce my carbon emissions			
I have more idea about how I can lobby politicians about climate change/global warming			
I feel more confused about what I can do about climate change/global warming			
I have a stronger intention to do something about climate change/global warming			
I feel less convinced that there is any point in trying to reduce my carbon emissions			
I feel more concerned about climate change/global warming			

6. What message are you taking away from the film? _____

_____

_____

THANK YOU! Please hand this to one of the researchers in the foyer to receive your £5 FILMHOUSE VOUCHER. If you forget to hand it in, please send it to: ***Rachel Howell, Edinburgh University, Geography Dept, Drummond St, Edinburgh EH8 9XP***

OPTIONAL
Please complete this sheet IF YOU HAVE NOT ALREADY GIVEN ME YOUR CONTACT DETAILS and you would be willing for me to send you a short follow-up survey in a few weeks (I will be offering a further 'thank you' to those who take part in the follow-up). ***This sheet will be separated from your answers to the survey to preserve your anonymity.***

Your name: _____

Your email:																									

Your postal address if you would prefer to be contacted that way:

_____

_____

THANK YOU! ***Rachel Howell***

This is the second questionnaire. Please separate the first one and hand it in BEFORE seeing the film. Turn over and fill in this second part AFTER the film. Thank you![12]

[12] This note was printed on the back of Q2, which was attached face down on each clipboard, under Q1 (which was face up), to discourage respondents from looking at the second questionnaire before seeing the film.

Appendix 3: Third *Age of Stupid* questionnaire (Q3)

Public opinion survey about *The Age of Stupid*[13]

Follow up survey: please fill this in ONLY IF you are the person who filled in the previous questionnaires about *The Age of Stupid* at the Filmhouse in March.

1. How concerned are you about the following global issues?
Please tick ONE BOX on EACH LINE

	Not at all concerned	***Not very concerned***	***A little concerned***	***Somewhat concerned***	***Very concerned***
AIDS					
Species extinctions					
Climate change/ global warming					
'Credit crunch'/recession					
Poverty					
Terrorism					

2. To what extent do you agree/disagree with the following statements?
Please tick ONE box on EACH LINE

	Strongly disagree			**Neutral** ↓			**Strongly agree**
	1	2	3	4	5	6	7
I feel motivated to try to do something about climate change/global warming							
I can do something to prevent climate change/global warming getting worse							
I know what I can do to reduce my carbon emissions							
Cutting my carbon emissions won't make a difference to the problem of climate change/global warming							
It's worth lobbying politicians about climate change/global warming							
I do as much as I can about climate change/global warming							
I fear humanity will not do enough to prevent catastrophic climate change/global warming							

[13] Most respondents completed this questionnaire online, using the Bristol Online Surveys tool.

3. Comparing how you feel NOW with how things were BEFORE YOU SAW THE FILM, how would you say the film has affected you? *Thinking of the film AND anything like a group you joined or an event you went to as a direct result of seeing the film, (but not events/groups etc that you would have gone to without seeing the film), please tick ONE box on EACH LINE.*

Because of seeing the film and things I've done/been to as a direct result of seeing the film…	**No**	**Yes, a bit**	**Yes, a lot**
I now feel more motivated to try to reduce my carbon emissions than I did before seeing the film			
I now feel more motivated to lobby politicians about climate change/global warming than I did before seeing the film			
I now have more idea about what I can do to reduce my carbon emissions than I did before seeing the film			
I now have more idea about how I can lobby politicians about climate change/global warming than I did before seeing the film			
I now feel more confused about what I can do about climate change/global warming than I did before seeing the film			
I now have a stronger intention to do something about climate change/global warming than I did before seeing the film			
I now feel less convinced that there is any point in trying to reduce my carbon emissions than I did before seeing the film			
I now feel more concerned about climate change/global warming than I did before seeing the film			

Please turn to page 3

4a. Below are some ways that people might be able to **raise awareness** and/or **lobby politicians** about climate change/global warming. Not all will necessarily be possible for you, or you may not want to do them. **Which of these things are you doing or have you done (at any time, not just since seeing the film)?** *Please tick ONE BOX on EACH LINE*

	I have not done/am not doing/can't do this	**I have done this/am doing it more, because of seeing the film**	**I have done/am doing this, but not because of seeing the film**
Trying to raise awareness among people I know about climate change/global warming (e.g. informal conversation; taking part in a discussion or event)			
Sent a pre-printed message/written to politician(s) about climate change/global warming, within the last 12 months			
Currently actively involved in an organisation campaigning about climate change/global warming			
Attended the 'climate change rally' outside the Scottish parliament on 22 April 2009			
Calculated my 'carbon footprint' within the last 12 months			

4b. Is there anything else you have done or are doing to raise awareness or lobby politicians (or others) about climate change/ global warming, **because of seeing the film**? No☐ Yes☐ *please specify*_____

_____

4c. If it were possible for you, would you like (or feel it necessary) to do more to raise awareness and/or lobby politicians about climate change/global warming? Yes☐ No☐ Not sure ☐ *If no or not sure, please go to Q5a (next page)*

4c. If yes, what, if any, are the main obstacles that prevent you from doing this? *Please tick as many reasons as apply*

☐ Cost ☐ Inconvenience/discomfort ☐ Lack of information
☐ Lack of time ☐ Lack of options ☐ Don't believe there's any point at the moment

☐ Other *please specify*_____ *Please turn to page 4*

5a. Below are some ways that people might be able to cut their carbon emissions from **home energy use**. Not all will necessarily be possible for you, or you may not want to do them. **Which of these things are you doing or have you done (at any time, not just since seeing the film)?** *Please tick ONE BOX on EACH LINE*

	I have not done/am not doing/can't do this	**I have done this/am doing it more, because of seeing the film**	**I have done/am doing this, but not because of seeing the film**
Installed energy efficient light bulbs in most/all lights			
Turned down thermostat or radiators, or cut time heating is on (to save energy, not because of warmer weather)			
Washing clothes at 30°C (usually/always)			
Drying clothes on a rack or line (usually/always), instead of using a tumble dryer			
Installed more insulation/draught-proofing			
Changed to 'green electricity' supplier/tariff			
Generating energy through home renewables (e.g. solar hot water)			

5b. Is there anything else you have done or are doing to cut your carbon emissions from home energy use, **because of seeing the film**?
No☐ Yes☐ *please specify*_____
_____

5c. If it were possible for you, would you like (or feel it necessary) to do more to cut your own carbon emissions from home energy use? Yes☐ No☐ Not sure ☐ *If no or not sure, please go to Q6a (next page)*

5d. If yes, what, if any, are the main obstacles that prevent you from doing this? *Please tick as many reasons as apply*
☐ Cost ☐ Inconvenience/discomfort ☐ Lack of information
☐ Lack of time ☐ Lack of options ☐ Don't believe there's any point at the moment
☐ Other *please specify*_____ *Please turn to page 5*

6**a.** Below are some ways that people might be able to cut their carbon emissions from **travel**. Not all will necessarily be possible for you, or you may not want to do them. **Which of these things are you doing or have you done (at any time, not just since seeing the film)?** *Please tick ONE BOX on EACH LINE*

	I have not done/am not doing/can't do this	**I have done this/am doing it more, because of seeing the film**	**I have done/am doing this, but not because of seeing the film**
Cut down on driving, or avoid driving at all, by walking/ cycling/ using public transport instead			
Car sharing/using a car club *if you never drive leave this line blank*			
Planning/taking holiday(s) without flying this year			
Decided to reduce/cut out holiday flying long term			

6b. Is there anything else you have done or are doing to cut your carbon emissions from travel, **because of seeing the film**?
No☐ Yes☐ *please specify*_____

_____

6c. If it were possible for you, would you like (or feel it necessary) to do more to cut your own carbon emissions from travel?
Yes☐ No☐ Not sure ☐ *If no or not sure, please go to Q7a (next page)*

6d. If yes, what, if any, are the main obstacles that prevent you from doing this? *Please tick as many reasons as apply*
☐ Cost ☐ Inconvenience/discomfort ☐ Lack of information
☐ Lack of time ☐ Lack of options ☐ Don't believe there's any point at the moment
☐ Other *please specify*_____

Please turn to page 6

7a. Below are some ways that people might be able to cut their carbon emissions from **food**. Not all will necessarily be possible for you, or you may not want to do them. **Which of these things are you doing or have you done (at any time, not just since seeing the film)?** *Please tick ONE BOX on EACH LINE*

	I have not done/am not doing/can't do this	**I have done this/am doing it more, because of seeing the film**	**I have done/am doing this, but not because of seeing the film**
Avoiding buying bottled water			
Buying more local produce			
Reduced meat consumption or eat vegetarian/vegan diet			
Composting food waste			

7b. Is there anything else you have done or are doing to cut your carbon emissions from food, **because of seeing the film**?
No☐ Yes☐ *please specify* _____
_____

7c. If it were possible for you, would you like (or feel it necessary) to do more to cut your own carbon emissions from food?
Yes☐ No☐ Not sure ☐ *If no or not sure, please go to Q8, below*

7d. If yes, what, if any, are the main obstacles that prevent you from doing this? *Please tick as many reasons as apply*
☐ Cost ☐ Inconvenience/discomfort ☐ Lack of information
☐ Lack of time ☐ Lack of options ☐ Don't believe there's any point at the moment
☐ Other *please specify*_____

8. Would you be willing to be contacted again if I do a further follow-up to this survey? Yes☐ No☐

PLEASE RETURN THIS QUESTIONNAIRE IN THE STAMPED ADDRESSED ENVELOPE PROVIDED.
******THANK YOU very much for your time and help in completing this questionnaire!******
Rachel Howell, Edinburgh University, Geography Department, Drummond Street, Edinburgh EH8 9XP

Appendix 4: Fourth *Age of Stupid* questionnaire (Q4)

Public opinion survey about *The Age of Stupid*[14]

Please fill this in ONLY IF you are the person who filled in the previous questionnaires about *The Age of Stupid* at the Filmhouse in March 2009.

1. How concerned are you about the following global issues?
Please tick ONE BOX on EACH LINE

	Not at all concerned	***Not very concerned***	***A little concerned***	***Somewhat concerned***	***Very concerned***
AIDS					
Species extinctions					
Climate change/ global warming					
'Credit crunch'/recession					
Poverty					
Terrorism					

2. To what extent do you agree/disagree with the following statements?
Please tick ONE box on EACH LINE

	Strongly disagree			**Neutral ↓**			**Strongly agree**
	1	2	3	4	5	6	7
I feel motivated to try to do something about climate change/global warming							
I can do something to prevent climate change/global warming getting worse							
I know what I can do to reduce my carbon emissions							
Cutting my carbon emissions won't make a difference to the problem of climate change/global warming							
It's worth lobbying politicians about climate change/global warming							
I do as much as I can about climate change/global warming							
I fear humanity will not do enough to prevent catastrophic climate change/global warming							

[14] Most respondents completed this questionnaire online, using the Bristol Online Surveys tool.

3a. Are you aware of the 10:10 campaign?
Yes☐ No☐ Not sure ☐ *If no or not sure, please go to Q4*

3b. If yes, have you been involved in trying to get any organisation to sign up to the 10:10 campaign (e.g. place of study or work, local council, social/sports club etc.)? Yes☐ No☐

3c. Have you signed up to the 10:10 campaign as an individual/household?
Yes☐ No☐ Not sure ☐

4a. At the time you saw *The Age of Stupid* at Edinburgh Filmhouse in March 2009, were you actively involved in any groups campaigning wholly or partly about climate change/global warming? (e.g. Friends of the Earth, RSPB, Oxfam, Transition Towns, WWF) *Being 'actively involved' includes writing letters as a result of being in the group, attending events organised by the group etc.*
Yes☐ No☐ Can't remember ☐

4b. If yes, which group(s)? ……..……..

…….

…….

5a. <u>As a result of seeing *The Age of Stupid*</u> did you sign up to receive information (by post, email etc) from any groups campaigning wholly or partly about climate change/global warming?
Yes☐ No☐ Can't remember ☐

5b. If yes, do you still receive information from this group/these groups?
Yes☐ No☐ Not sure ☐

6a. <u>As a result of seeing *The Age of Stupid*</u> did you become actively involved in any group(s) campaigning wholly or partly about climate change/global warming?
Yes☐ No☐ Can't remember ☐ *If no or can't remember, please go to Q7(p.3)*

6b. If yes, which group(s)? ……..……..

…….

…….

6c. Are you still involved in at least one of the group(s) that you joined as a result of seeing the film?
Yes☐ No☐

Please turn to page 3

7. Below are some ways that people might be able to take action about climate change/global warming. Not all will necessarily be possible for you, or you may not want to do them.
For each action, which statement best fits your situation? *Please tick ONE BOX on EACH LINE*

	I started or increased doing this because of the film but this didn't last	**I started or increased doing this because of the film and I've continued**	**I am doing this, but not because of seeing the film**	**I am not currently doing this/can't do this**
Trying to raise awareness among people I know about climate change/global warming (e.g. informal conversation; taking part in a discussion or event)				
Turned down thermostat or radiators, or cut time heating is on (to save energy, not because of warmer weather)				
Washing clothes at 30°C (usually/always)				
Drying clothes on a rack or line (usually/always), instead of using a tumble dryer				
Changed to 'green electricity' supplier/tariff				
Generating energy through home renewables (e.g. solar hot water)				
Cut down on driving, or avoid driving at all, by walking/ cycling/ using public transport instead				
Car sharing/using a car club *if you never drive leave this line blank*				
Planning to reduce/cut out holiday flying long term				

Please turn to page 4 where this question is continued

	I started or increased doing this because of the film but this didn't last	I started or increased doing this because of the film and I've continued	I am doing this, but not because of seeing the film	I am not currently doing this
Avoiding buying bottled water				
Buying more local produce				
Reduced meat consumption or eat vegetarian/vegan diet				
Composting food waste				

8. Did you take a holiday involving flying during April – December 2009? Yes☐ No☐

9. Have you taken a holiday involving flying this year, or are you going to do so?
Yes☐ Probably will☐ Possibly will☐ No☐

If you would like to make any comments or add anything, please do so here:

PLEASE RETURN THIS QUESTIONNAIRE IN THE STAMPED ADDRESSED ENVELOPE PROVIDED.
******THANK YOU very much for your time and help in completing this questionnaire!******
Rachel Howell, Edinburgh University, Geography Department, Drummond Street, Edinburgh EH8 9XP

Appendix 5: Interview participant information sheet

Lower-carbon lifestyles research project

Participant information sheet

Research carried out by: Rachel Howell, PhD student, University of Edinburgh
Contact: r.a.howell@sms.ed.ac.uk Tel: 0131 557 8376

Thank you very much for agreeing to be interviewed for my research.

The interview will be audio recorded, stored on computer, and transcribed. Your name will not be attached to the recording or the transcript; these will be numbered and names will not be linked to the numbers.

Your 'life graph sketch' may be scanned and stored on computer, and the originals will also be kept.

I will use the information collected when writing my thesis, and potentially for journal articles, oral presentations, reports and other types of communication. Confidentiality will be maintained throughout the research and any information you give will be anonymised in any outputs such as my thesis. Any quotes from interviews or the 'life graph sketch' notes will have pseudonyms attached.

If you agree to take part, you may withdraw from the research without penalty at any time by informing me of your decision to do so. You will of course also be free to decline to answer any questions during the interview whilst still remaining within the process.

If you have a concern about any aspect of this project, or would like to ask any questions, please do not hesitate to contact me.

Rachel Howell

Appendix 6: Interviewee consent form

Lower-carbon lifestyles research project

Consent to participate

Research carried out by: Rachel Howell, PhD student, University of Edinburgh
Contact: r.a.howell@sms.ed.ac.uk Tel: 0131 557 8376

Please tick to indicate your agreement with the following:

☐ I have read the participant information sheet

☐ I have had the opportunity to ask questions about the study and have received satisfactory answers to my questions, and any additional details requested

☐ I understand that I may withdraw from the study without penalty at any time by advising the researcher of this decision

☐ I understand how the data I provide will be stored and used

☐ I agree to participate in this study

Permission for use of data

Please indicate below how I may use the information you give. This is completely up to you. The data will only be used in ways you agree to. **Your name will not be linked to any data.** *Please circle as appropriate*:

The records can be used in the research project, including for reports, publications and my thesis	Yes	No
The records can be used at scientific meetings, conferences etc	Yes	No
The records can be kept in an archive to be used by other researchers	Yes	No
The records can be used for teaching purposes	Yes	No
The records can be used in public presentations to non-scientific groups	Yes	No

Signed by interviewee…… Date: ……..

Please print your name in BLOCK CAPITALS…….……

Appendix 7: Life graph instructions for interviewees

Drawing a 'life graph sketch' for your car use

I'd be very grateful if you could sketch for me a 'life graph' showing how your car use has changed over the course of your life. To explain what a life graph sketch is, I've sent you an example of one showing how the amount of fiction read by someone varied over the first 25 years or so of their life. Below the graph are notes written by this imaginary person to explain the practical reasons for the changes in their fiction reading habits, plus the feelings and opinions they had at different times about reading fiction, what it meant to them, what values were associated with it, etc. I deliberately chose an example which has nothing to do with car use so as not to influence you but I hope this is a helpful guide.

What goes on the sketch?

- **Any kind of use of a *private car***, whether as driver or passenger; own car, hire car, friend's car etc.
- When you show amount of car use, please think about both the number of trips and their length. But **the graph doesn't need to show exact measurements**, either of time or of car use! You don't need to do complicated calculations about mileage per year or anything like that. The 'graph' is a pictorial guide rather than a real graph. I'm just looking for an idea of when and why car use has changed in your life, and whether the changes have been gradual or sudden; what factors lead to it being high or low, steady or fluctuating. I'm not trying to calculate your likely emissions.

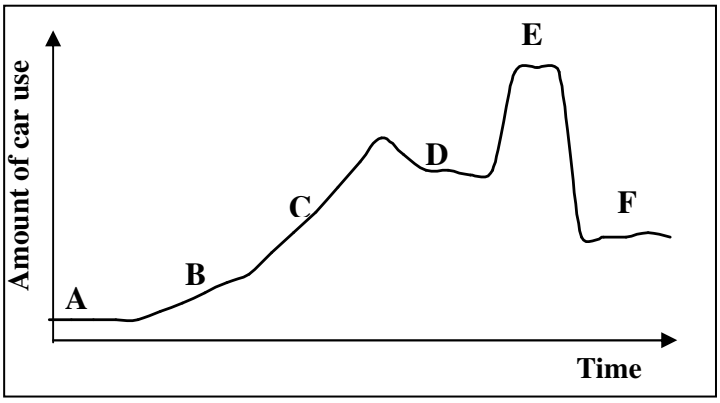
Please include in the notes:

- **Info about what kind of journeys you were mostly making**, whether as driver or passenger, whether in your own car or another. e.g. "driving daily to work in own car without passengers (10 miles/day), plus some weekend and holiday trips with others"; "didn't own car; hired one for family trips about 20 times per year".
- **Info about thoughts, feelings, opinions etc** that you had about your car use at the time (including having no opinions/feelings about it!)
- **Info about the kind of car you were using IF this made a difference to how much you used it**.
- **You don't need to try and include every last little detail – just the main trends**.

There's no need to do your life graph exactly like the example:

- **Feel free to do yours by hand** as that'll probably be easier and quicker than by computer.
- As long as your life graph is legible **there's no need for it to be smart**!
- **You don't have to put the graph and the notes about it on one page**. You could do the notes in a grid like the example but on a separate sheet of paper, or you could just label your graph with letters to identify different sections, then write notes separately without a grid:

continued

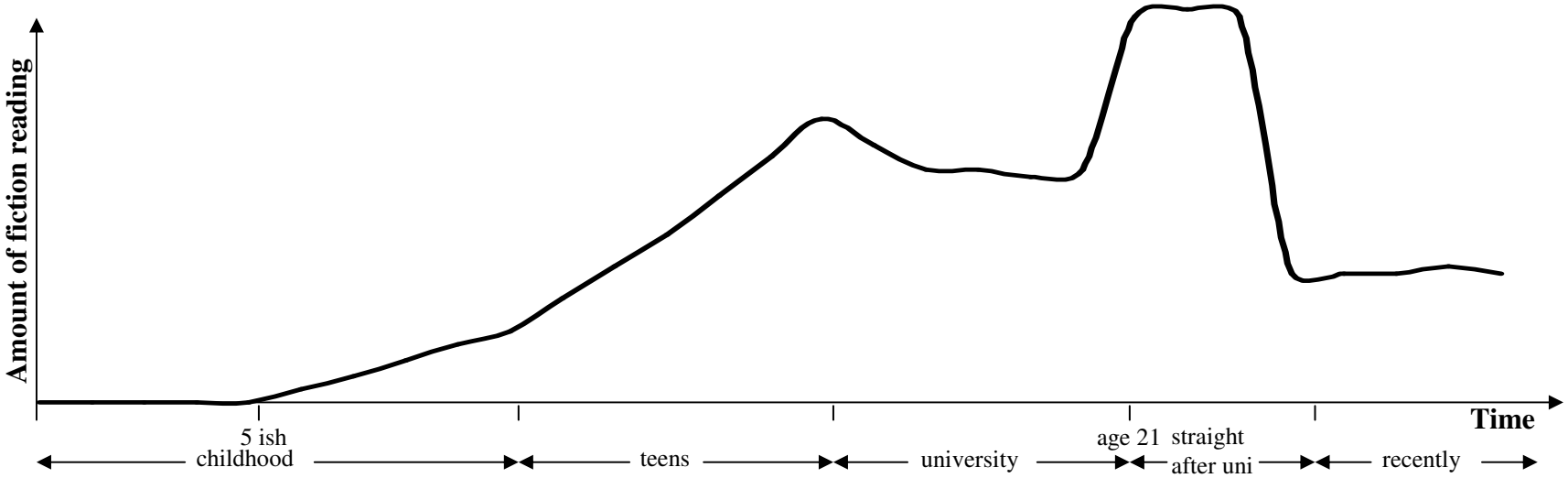


A. Early childhood: travelled with parents in car as passenger for weekend shopping trips and holidays. Found long trips boring but otherwise didn't think about it

etc

- **Choose whatever time periods make sense for you on the time axis** – you don't have to divide it into 'childhood/teens/university' etc if those distinctions aren't relevant as regards your car use.
- **Use as much paper as you need to fit everything in**. Your life graph will probably be rather more complicated than the example. If you can fit the graph on an A4 sheet that's great, but if you need to tape several sheets together or use the back of some old wallpaper then do!
- **Please don't put your name on the graph** because with your permission I might include it in my thesis, presentations, articles etc and I want to protect your identity. **THANKS!**

See next page for the example life graph sketch



Practicalities	Couldn't read	Learnt to read and was encouraged to read stories	Introduced to new authors at school & got adult library ticket so more novels available	Less time to read – more work to do & also more opportunities to do other things	Broke up with girlfriend and was unemployed – lots of time to read	Got a job (less reading time) and now read fewer novels because have got into reading biography, history & philosophy
Feelings, opinions, values	Have a few memories of stories being read to me – liked that	Enjoyed stories & liked being able to enter fantasy world	Loved reading & had friends who loved reading so it seemed normal to read a lot, even though got teased for liking reading not football which annoyed me	Reading novels started to feel like a special treat & I thought it was important to read 'quality literature'	Felt depressed so reading was a comfort. Read lots of light stuff – didn't feel it had to be quality	Have decided just reading fiction is a bit dull

Appendix 8: Lower-carbon lifestyles interview guide

Preliminaries
Intro me/purpose of research – will give more information at end if desired
Consent form and payment
Quite wide ranging interview – feel free not to answer any questions
I'm interested in whatever you want to say – take however long you want
Will send transcript that you can comment on/add to
Any questions before we start?

Start recording
Give number of interviewee, group, date

- Do you see yourself as someone who's deliberately trying to live a lower carbon lifestyle because of climate change? Are there other reasons?
- What kind of things are you doing to cut your carbon footprint?

OK, thanks. So now it would be great if you could tell me the story of how and why your action developed. I don't want to ask a lot of questions about this, I'd rather you just tell me the story in the way you want to – whatever you see as part of the story in terms of influences, milestones, difficulties etc. Take as long as you want to tell the story fully, and start wherever you think the beginning is.

Discussion of the life graph sketch of car use

[The following questions will depend on what has been covered by the narrative][15]

Values/responsibility
- Can you tell me when you first became aware of the issue of climate change? Were you concerned right away or did it take some time to become so?
- What do you think it is about you, your upbringing, experience or whatever that has led you to have a particular concern about climate change? (e.g. if have mentioned news reports as being the start of concern, *why* did those move you?)
- Why do you care about climate change? (i.e. what is it that concerns you?)
- Would you say there is any kind of spiritual/religious/humanist basis for your concern or would you not put it in those terms?
- Why do you take action even when others don't?
- Do you think what you do makes a difference in some way? If so, in what way? How much?
- How do you respond when others say "climate change is not my fault"?
- What do you see as the relative role of individuals, government, business etc in tackling climate change?

continued

[15] I did not cover all these questions with all interviewees; depending on how the interview was going I added other 'prompt' questions, changed the order of questions/sections, and/or missed questions out.

Information and learning
- Where do you get your information about the causes and consequences of climate change from? What sources do you trust? Any you don't trust?
- What about information about solutions – personal and policies?

Discourses/images
- What images come to mind when I say 'climate change'?
- How do you feel about those images?
- What images come to mind when I say 'a low carbon lifestyle'?
- How do you feel about them?
- If you're talking publicly or socially to people who are not your close friends or members of the group is there a particular message you try to get across? Do you ever feel you can't say publicly what you think privately?

Involvement in the group/project [if relevant]
- When and for how long? Is it ongoing?
- Who's involved? (Numbers, gender etc)
- What does the group do? What kind of things happen at meetings?
- What does the group offer – if someone asked why it's worth belonging what would you say?
- Why this particular group/project? What do/did you hope to get out of it?

Stages of change
- What kind of changes have you made?
- What were you doing/had you done before getting involved in your group?
- How does the group try to help people change?
- What processes have you found most helpful in making changes?
- What would you need more of in order to make further/other changes?
- Are there things that don't work/help; if so, what?

So far I've just asked you questions and listened, not commented myself. What I'd like to do now is to revisit some of what we've talked about and develop it into more of a conversation; so I'll comment on what I've heard you say and maybe offer a bit more of my own experience or perspective, see what comes of that. Is that OK?[16]

Closing questions
Of what we've discussed, is there anything that stands out as particularly important to you?
Anything more you would like to add? Anything we haven't covered that you think important?

[16] What was covered at this point depended on what I had picked out of an interview to explore further, but usually included discussion of whether an interviewee's concern about climate change related more to concern about humans or 'the environment' or 'nature' *per se*, and whether they felt their actions had been more influenced by their values or the structures around them (including physical infrastructure, and social structures such as norms).

Thirteen values are listed below. *Note the explanations (in parentheses) of what is meant in this survey by each value*. This is a standard question used in many studies so please use the definitions given. Please indicate how important each value is for you **AS A GUIDING PRINCIPLE IN YOUR LIFE**.

0 means the value is not at all important; it is not relevant as a guiding principle for you.
3 means the value is important.
6 means the value is very important.
-1 is for rating any values **opposed** to the principles that guide you.
7 is for rating a value of supreme importance as a guiding principle in your life; **ordinarily there are no more than two such values**.

Obviously, the higher the number, the more important the value is as a guiding principle in YOUR life. **Please try to distinguish as much as possible between the values** by using different numbers.

	opposed to my values	*not important*			*important*			*very important*	*of supreme importance*
EQUALITY (equal opportunity for all)	-1	0	1	2	3	4	5	6	7
RESPECTING THE EARTH (harmony with other species)	-1	0	1	2	3	4	5	6	7
SOCIAL POWER (control over others, dominance)	-1	0	1	2	3	4	5	6	7
UNITY WITH NATURE (fitting into nature)	-1	0	1	2	3	4	5	6	7
A WORLD AT PEACE (free of war and conflict)	-1	0	1	2	3	4	5	6	7
WEALTH (material possessions, money)	-1	0	1	2	3	4	5	6	7
AUTHORITY (the right to lead or command)	-1	0	1	2	3	4	5	6	7

continued on next page

	opposed to my values	*not important*			*important*			*very important*	*of supreme importance*
SOCIAL JUSTICE (correcting injustice, care for the weak)	-1	0	1	2	3	4	5	6	7
PROTECTING THE ENVIRONMENT (preserving nature)	-1	0	1	2	3	4	5	6	7
INFLUENTIAL (having an impact on people and events)	-1	0	1	2	3	4	5	6	7
HELPFUL (working for the welfare of others)	-1	0	1	2	3	4	5	6	7
PREVENTING POLLUTION (protecting natural resources)	-1	0	1	2	3	4	5	6	7
AMBITIOIUS (hard-working, aspiring)	-1	0	1	2	3	4	5	6	7

Appendix 10: CRAG details questionnaire

CRAGs factual questionnaire[17]

Please note that by filling in and returning this questionnaire you are giving your consent for the information contained to be used as explained in the participant information sheet you have been sent.
Any questions? Contact: rachel.howell@ouce.ox.ac.uk Tel: 01865 285173

Name of the CRAG you're involved in:

How long have you been involved in the CRAG?

How long has it been in existence?

How many adult members are there?

When did/does your carbon year start?

What is your carbon target for this year?

And for any past years? Year Target

Year Target

Which carbon calculator is used?

Do you have a financial penalty?

If so, how much is it?

And what was it in any previous years? Year Penalty

Year Penalty

Thank you!

[17] This questionnaire was sent to people who were interviewed as part of the project on Carbon Rationing Action Groups, prior to the interviews.

Appendix 11: CRAG project interview guide

Preliminaries
Intro me/purpose of research – willing to give more information at end
Consent form and payment
Feel free not to answer any questions
Any questions before we begin?

Start recording
Give number of interviewee, CRAG, date

Openers
- Can you tell me a bit about who's involved in your CRAG – how many people, age range, gender balance, whether CRAGgers have children?
- Did you know the other members before you got involved? Would it have made a difference if you had/hadn't?
- How often does the CRAG meet and what do you do at meetings?
- Do you live with other people, and if so, are they involved in any way?

Your involvement
- How did you find out about the CRAG and why did you get involved? (Both where does your concern about carbon emissions come from and what did you hope to get out of involvement?)
- Were you involved in any way in setting it up?
- Is there anything in particular that appeals to you about CRAGs?

Looking at the carbon 'ration'/target:
- Same target for everyone or individual targets? Why?
- How did your CRAG decide the target?
- What is included and why? (kids/public transport/green electricity)
- Does each person do their own accounting or do you have a 'carbon accountant'?
- How often do you do the accounting? (As group/individually?)
- Have you kept within the target in the past/are you on course with the current target?
- What about other members of the group?

Behaviour change
- [If on target:] were you already at/below target, or have you cut your emissions?
- [If have cut emissions:] how much, over how long? How? (transport/home energy; technology/behaviour change?) Do you think being in the CRAG has helped or would you have done it anyway?
- [If have not cut emissions:] why?
- Can you tell me a bit about what you've found easy/difficult with regards change? What helps, what hinders?

continued

- Were you already trying to limit your emissions before joining the CRAG, and if so, did you manage to?
- How much potential for change did you feel there was when you started in the CRAG? Has that changed at all?
- Do you feel you understand more about where your emissions come from than before? Do you find it easy/difficult to relate e.g. miles driven/hours of heating use to carbon emissions?
- Has the amount you take note of energy use changed?

Trading

- Penalty: Why? Why not?
  How was this decided?
- [If penalty:] What do you do with it?
- [If trading happens:] Do you like the trading aspect? Why?
- [If trading doesn't happen:] Would you like to trade?
- Would you be interested in trading between CRAGs/other groups?
- What do you think about PCT?
  Do you see any relationship between CRAGs and PCT?
- If you had an official PCA would you trade? Explain?

Finally – CRAGs

- Anything more to say about what you have got out of being in a CRAG? What's the point of being in a group? [if not covered already]
- What about limitations, any ways in which your expectations/hopes not met?

A bit more about you

- Do you belong to/volunteer with any environmental/world development/ community/charitable groups?
- Are there other concerns that you address through your lifestyle? (Are there things you deliberately buy/do or avoid buying/doing because of concerns other than climate change?
- If you were going out to buy a pair of jeans, what kind of things would influence what you buy? – what kind of things would you be looking at? (style, price, label, type of shop, where made etc)
- Same question with electronic goods e.g. computer